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IN THIS ISSUE

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PUBLIC HEALTH REPORTS

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STUDIES ON CHRONIC BRUCELLOSIS

III. Methods Used in Obtaining Cultures

By MARY A. POSTON, *Laboratory Assistant, National Institute of Health, United States Public Health Service*[1]

The bacteriological studies reported in this paper were made in connection with the survey of chronic brucellosis in Charlotte, N. C., which will be reported by Dr. Frank H. Robinson in a subsequent paper of this series. Fourteen patients in whom chronic brucellosis was suspected were studied. In none of these patients could a diagnosis of brucellosis be made by specific tests

Fifteen cc of blood were obtained from each patient by venepuncture. The blood was placed in small flasks containing 4 cc of sterile 2.5 percent sodium citrate. Four flasks containing 100 cc of liver infusion broth of pH 6.8 were each inoculated with 2 cc of the citrated blood. The flasks were incubated at 37° C, two in the room atmosphere and two in an atmosphere containing 10 percent CO_2.

After 4 days' incubation, daily smears of the broth cultures were made and stained by Gram's method. If no organisms were seen in the smears after 10 days' incubation, 5 cc of the original culture was transplanted to 100 cc liver infusion broth every 3 days for 2 weeks. Original cultures and transplants were incubated for 3 weeks before they were reported as negative.

Three guinea pigs were inoculated with blood from each patient. Two were injected intraperitoneally with 2 cc each of citrated blood, and one was inoculated in the groin with 1 cc of citrated blood. The animals were observed daily.

Beginning 2 months after inoculation, tests for specific agglutinins and for reaction to Huddleson's brucellergin were made at intervals of a few days. When both tests became positive, the animals were killed. The animals which remained negative to the agglutinin and the skin tests were killed 4½ months after inoculation. Broth was planted with blood and with pieces of organs according to the cultural methods already described.

Cultures were obtained from 5 of 14 patients—from 3 in broth cultures, and from all 5 by guinea pig inoculation. The cultures were identified by agglutinin absorption according to the technique described by Evans, and by the bacteriostatic reaction of dyes according to Huddleson's method.

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[1] These studies were made in the Bacteriological Laboratories of Duke Medical School, Durham, N. C.

Table 1 shows that the cultures from 3 of the 5 cases were identified as *Brucella melitensis* var. *melitensis*. These data are in agreement with the observation of Evans, who reported that agglutinin absorption tests with patient's blood indicated that the majority of human *Brucella* infections in Charlotte, N. C., are with the *melitensis* variety.

TABLE 1.—*Summarized data on the cultivation of Brucella from 5 chronic patients*

Case no.	Cultures directly from blood	Results of guinea pig inoculation				Variety of the infecting organism	Remarks
		Pig no.	Appearance of agglutinins	Time of killing	Cultures		
5	Positive [a]	[b] 1	Animal died 3 weeks after inoculation.		Positive	Suis	Spleen and liver showed abscesses. Cultures were obtained from both organs
		[b] 2	11 weeks	17 weeks	do		Cultures were obtained from organs
		[c] 3	12 weeks	do	do		Do.
59	Negative	[b] 1	Nonspecific death.				
		[b] 2	do				
		[c] 3	16 weeks	20 weeks	Positive	Melitensis	The only lesion was an enlarged inguinal gland, from which a culture was obtained.
67	Positive	[b] 1	Nonspecific death.				
		[b] 2	13 weeks	15 weeks	Positive	Abortus	Culture was obtained from heart blood.
		[c] 3	11 weeks	19 weeks	do		Do.
107	Negative	[b] 1	Nonspecific death.				
		[b] 2	do				
		[c] 3	12 weeks	14 weeks	Positive	Melitensis	Cultures were obtained from heart blood, liver, and spleen.
411	Positive	[b] 1	Animal died 6 weeks after inoculation.		Positive	Melitensis	Lesions were found in liver, spleen, and lungs. Cultures were obtained from liver and lungs
		[b] 2	11 weeks	19 weeks	Negative		No gross lesions.
		[c] 3	13 weeks	do	do		Do.

[a] Cultures were obtained from the joint fluid also.
[b] The animal was inoculated intraperitoneally.
[c] The animal was inoculated in the groin.

Brucella were obtained in cultures planted with blood from cases 5, 67, and 411.[3] In cases 5 and 411 small Gram-negative coccobacilli were seen in the original aerobic broth cultures on the 7th and 10th days, respectively. Transplants were made to liver infusion broth, and liver infusion blood agar plates were streaked with the culture. Good growth was obtained in 48 hours. *Brucella melitensis* var. *suis* was also cultured from synovial fluid obtained from case 5. After 3 days' incubation, growth was obtained from the original aerobic broth cultures planted with the fluid.

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[3] Robinson's case numbers are used in this paper.

Blood culture was obtained from case 67 only in a transplant of the original culture. After 10 days' incubation of the original cultures, transplants were made, and in one of the secondary cultures *Brucella melitensis* var. *abortus* developed after 4 days' incubation in the presence of CO_2. The original broth cultures and the transplanted cultures incubated aerobically remained clear.

The records of the guinea pigs inoculated with blood from the 5 cases which yielded cultures are summarized in table 1. Ten of the 15 injected animals survived spontaneous death. The table shows that cultures were obtained from 8 of the 10 animals. Two of the 8 died about a month after inoculation. In the remaining 6 animals, agglutinins did not appear until the 11th to the 16th week. Probably cultures would not have been obtained from these animals if they had been killed at the end of 6 weeks, the time which is usually recommended for the killing of guinea pigs injected with suspected *Brucella* infected material.

The record of one guinea pig which developed agglutinins about 14 weeks after inoculation is given in table 2.

TABLE 2 *Record of guinea pig inoculated in the groin with blood from case 67 (inoculation made Dec 8, 1936)*

Date	Reactions to agglutinating antigen			Reaction to brucellergin
	Melitensis	Abortus	Suis	
1937				
Feb 4		—	—	—
Feb 14		—	—	—
Feb 22		—	—	—
Feb 28			—	—
Mar 7			—	—
Mar 17	1 20	1 20	1 20	—
Mar 19	1 20	1 40	1 20	—
Mar 20	1 40	1 40	1 20	++
Apr 7	1 20	1 40	1 20	++

On April 19, 1937, the pig was killed. The inguinal gland at the site of injection was slightly swollen. The spleen was slightly enlarged, with no abscesses. The lungs, liver, and kidneys were normal. *Brucella melitensis* var. *abortus* was obtained from the gland and from the blood in cultures grown in the presence of CO_2.

Twenty-seven animals, inoculated with the blood of 9 patients, remained negative to the agglutinin and skin tests. They were killed 4½ months after inoculation. No lesions were found at autopsy, and cultures of heart blood, liver, and spleen gave no growth.

SUMMARY

Brucella cultures were obtained from 5 out of 14 patients with obscure chronic disease.

The organisms developed in broth cultures planted with blood from 3 of the patients. They were obtained by means of guinea pig inoculation from all 5 patients.

Three of the strains were identified as *Brucella melitensis* var. *melitensis*. One strain was identified as *suis* and one as variety *abortus*.

A point in our technique which differed from that usually followed by other investigators was the keeping of the guinea pigs until specific reactions indicated *Brucella* infection. In one animal positive reactions first appeared 16 weeks after inoculation. Animals which failed to develop agglutinins were kept 4½ months before being discarded.

AGE OF GAINFUL WHITE AND NEGRO FEMALE WORKERS OF THE UNITED STATES, 1920 AND 1930[1]

Studies on the Age of Gainful Workers No. 5

By WILLIAM M. GAFAFER, *Senior Statistician, United States Public Health Service*

INTRODUCTION

The fourth paper of this series (*1–4*) dealt with the age of gainful white and Negro male workers of the United States by occupational group for the census years 1920 and 1930. The percentage age distribution for each occupational group, specific for color and census year, was compared with the percentage age distribution of all gainful workers by forming the ratios of corresponding percentages. A ratio greater than 1 indicated for a particular census year an excess of workers in a specific age, color, and occupational group, while a ratio less than 1 indicated a dearth of workers. Chief among the differences found with respect to color were the following: (*a*) The larger dearth among the Negroes of both census years in the child group of extraction of minerals, and the manufacturing and mechanical industries. (*b*) The larger dearth among the Negroes of 1920 in the old-aged group of trade. In trade also there was in 1930 a dearth of white workers in the younger ages, while the Negroes showed an excess. (*c*) The large excesses among the white workers of 1920 and 1930 in the old-aged group of public service. In 1920 the Negroes showed a dearth in this age group which became a slight excess 10 years later. (*d*) The larger excesses among the Negroes of both years in the older ages of professional service. (*e*) The excesses of white workers and the dearths of Negro workers of both years in the older ages of domestic and personal service. And, finally, (*f*) the larger excess of Negroes in 1920 in the child group of clerical workers. In 1930 the excesses of both white and Negro workers decreased, the excess of the latter becoming a dearth.

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[1] From the Division of Industrial Hygiene of the National Institute of Health, U. S. Public Health Service, Washington, D. C.

The question now logically arises of the behavior of the ratios in the instance of white and Negro female workers. Accordingly, the present paper will include the determination and subsequent comparison of these ratios, specific for census year, age, color, and occupational group. When it appears desirable, for comparative purposes, reference will be made to the previously determined male ratios.

The term *gainful worker* is defined by the Bureau of the Census thus: "* * * all persons 10 years old and over who usually follow a gainful occupation even though they may not have been actually employed at the time the census was taken. It does not include women doing housework in their own homes without wages and having no other employment, nor children working at home, merely on general household work, on chores, or at odd times on other work" (*5*). The present inquiry, like the previous ones, makes use of basic data published by the Bureau of the Census in its population reports of 1920 and 1930.

WORKERS IN DIFFERENT OCCUPATIONAL GROUPS

The white and Negro female workers of 1920 and 1930, respectively, are shown distributed among nine occupational groups in table 1.

TABLE 1.—*Gainful white and Negro female workers in the United States, 10 years of age and over, specific for occupational group, 1920 and 1930*

Occupational group	1920		1930	
	White	Negro	White	Negro
	Number		Number	
All groups	6,962,216	1,571,289	8,817,561	1,840,642
Agriculture, forestry, animal husbandry	467,013	612,261	393,844	495,304
Extraction of minerals	2,512	337	602	53
Manufacturing and mechanical industries	1,821,165	104,983	1,761,846	101,070
Transportation and communication	209,446	3,525	278,530	2,208
Trade	656,013	11,158	940,503	14,568
Public service (n. e. c.)[1]	20,812	968	16,584	930
Professional service	976,821	39,127	1,459,738	63,027
Domestic and personal service	1,390,957	790,631	1,989,480	1,152,560
Clerical occupations	1,417,507	8,301	1,973,301	10,862
	Percent		Percent	
All groups	100.0	100.0	100.0	100.0
Agriculture, forestry, animal husbandry	6.7	39.0	4.5	26.9
Extraction of minerals	(2)	(2)	(2)	(2)
Manufacturing and mechanical industries	26.2	6.7	20.0	5.5
Transportation and communication	3.0	.2	3.2	.1
Trade	9.4	.7	10.7	.8
Public service (n. e. c.)[1]	.3	.1	.2	.1
Professional service	14.0	2.5	16.5	3.4
Domestic and personal service	20.0	50.3	22.5	62.6
Clerical occupations	20.4	.5	22.4	.6

[1] N. e. c.=Not elsewhere classified.
[2] Less than 1/10 of 1 percent

In 1920 there were approximately 7 million white female workers and less than 2 million Negroes; in 1930 the figures for both races showed increases, approximately 27 and 17 percent, respectively. The increases for the white and Negro males were previously found to be about 13 percent in each instance. As in the case of the males the largest increase occurred in professional service, 61 percent for the Negroes and 49 percent for the white workers. Trade increased 43 and 31 percent for the white and Negro workers, respectively; domestic and personal service, 43 and 46 percent; and clerical occupations, 39 and 31 percent. In both races the following occupational groups showed decreases: Extraction of minerals; public service; agriculture, forestry, and animal husbandry; and manufacturing and mechanical industries. Transportation and communication showed a 33-percent increase for the white workers and a 37-percent decrease for the Negroes. Thus four occupational groups disclose decreases for the white female workers and five for the Negroes. In the preceding paper decreases were indicated for the white males in extraction of minerals; and agriculture, forestry, and animal husbandry; while the Negroes showed decreases in the latter and in public service. The following percentages calculated from table 1 refer to the increases or decreases in the number of female workers in each occupational group during the 10-year period:

Occupational group	Percentage increase or decrease, 1920 to 1930	
	White	Negro
All groups	+26.6	+17.1
Agriculture, forestry, animal husbandry	−15.7	−19.1
Extraction of minerals	−72.5	81.3
Manufacturing and mechanical industries	3.1	−3.7
Transportation and communication	+33.0	−37.4
Trade	+43.4	+30.6
Public service (not elsewhere classified)	−20.3	3.7
Professional service	+49.4	+61.1
Domestic and personal service	+43.0	+45.8
Clerical occupations	+39.2	+30.9

When the percentages of female workers in each occupational group, specific for color and census year, as shown in table 1, are arranged in decreasing order of magnitude, it is found that in the instance of the white workers of 1920 the manufacturing and mechanical industries rank first with 26 percent, and clerical occupations, and domestic and personal service follow with approximately 20 percent each. Ten years later the white females show the same occupational groups as leading, with percentages between 20 and 23 percent, but the order of 1920 is changed, the manufacturing and mechanical industries dropping from first to third place, from 26 to 20 percent, and the clerical occupations and domestic and personal service each increasing

2 points. The Negro workers, on the other hand, show the same order in 1920 and 1930 with respect to percentage distribution by occupational group, domestic and personal service ranking first, with agriculture, forestry, and animal husbandry, second. The most striking changes that the 10 years have wrought probably occurred among the Negroes in these two occupational groups; in domestic and personal service there was an increase from 50 to 63 percent, and in agriculture, forestry, and animal husbandry, a decrease from 39 to 27 percent. In the instance of the male Negroes the same occupational groups offered the most striking changes during the 10-year period, the corresponding changes being from 8 to 12 percent, and from 48 to 42 percent, respectively.

WORKERS IN DIFFERENT OCCUPATIONAL GROUPS, BY AGE

The age distribution of the white and Negro female workers of 1920 and 1930 according to occupational group is shown in table 2. It will be observed that, regardless of occupation, the order of importance of the age groups of the white workers of 1920 is slightly disturbed by the passage of 10 years and specifically by the reduction in the percentage of child workers from 11 to 6 percent. The Negro workers, on the other hand, present the same order in 1930 as in 1920, the most important change, as in the instance of the white workers, being the decrease in the percentage of child workers (13 to 9 percent). In both census years the two races contribute 40 to 50 percent of their respective workers to the age group 25 44 years, the leading age group with respect to size in both races. In the instance of the white workers the age group 20 24 years follows in both years with approximately 23 percent; the corresponding percentage for the Negroes is 16 percent, which is sufficiently small to allow the middle-aged group, 45 64 years, to assume second place in both years with about 18 percent.

The remainder of this section will be devoted to an examination of the age distribution of the workers in different occupational groups, with emphasis particularly on the contribution of each occupational group to the child, middle- and old-aged categories, respectively.

Further reference to table 2 reveals that the white child group of 1920 in agriculture, forestry, and animal husbandry was 24 percent of the total number of white workers so engaged. No other occupational group furnished a corresponding percentage so large. The Negro girl group for the same year shows a percentage in agriculture, forestry, and animal husbandry similar to that for the white girls, and, as in the instance of the white workers, this particular occupational group ranks first. The various percentages shown for the white girl group contrast remarkably with those for the white boys. The highest percentage among the latter was 10 percent, which was

TABLE 2.—*Age distribution of gainful white and Negro female workers in the United States, specific for occupational group, 1920 and 1930*

Occupational group	Age group, 1920							Age group, 1930						
	10 years old and over	10-17	18-19	20-24	25-44 [1]	45-64	65 and over	10 years old and over	10-17	18-19	20-24	25-44 [1]	45-64	65 and over
	Number	Percent						Number	Percent					
	White							White						
All groups	6,962,346	10.706	10.040	22.320	39.221	15.513	2.200	8,817,564	6.100	9.300	23.026	41.431	17.633	2.510
Agriculture, forestry, animal husbandry	467,013	24.108	5.479	8.626	26.264	27.229	8.294	393,844	19.142	6.012	9.052	24.380	31.132	10.282
Extraction of minerals	2,512	16.322	10.709	17.396	38.455	14.729	2.389	692	12.428	13.295	19.653	32.803	19.075	2.746
Manufacturing and mechanical industries	1,821,165	16.133	11.306	19.871	37.203	14.094	1.355	1,764,886	10.790	11.959	21.197	38.441	15.694	1.919
Transportation and communication	209,446	14.560	18.973	33.439	29.344	3.445	.239	273,536	6.384	14.758	31.730	39.972	6.671	.485
Trade	656,013	10.438	10.205	20.859	43.704	13.696	1.098	940,503	5.196	8.871	18.909	45.415	19.964	1.645
Public service (n. e. c.) [2]	20,312	.437	2.465	13.276	55.958	25.745	2.119	16,584	.253	.392	8.870	51.652	35.239	3.594
Professional service	978,521	1.237	6.815	29.358	48.489	13.001	1.100	1,459,738	.587	4.893	27.447	49.137	16.359	1.577
Domestic and personal service	1,390,957	6.006	5.386	12.668	41.659	29.443	4.838	1,989,489	5.792	7.086	14.657	38.494	28.889	5.082
Clerical occupations	1,417,507	10.151	15.421	33.775	36.436	4.011	.206	1,973,301	4.127	12.577	33.474	42.993	6.553	.276
	Negro							Negro						
All groups	1,571,289	13.295	6.507	16.064	44.211	17.180	2.743	1,840,642	9.330	6.168	16.250	47.099	18.810	2.343
Agriculture, forestry, animal husbandry	612,291	25.501	7.465	14.686	34.856	14.986	2.506	485,394	23.871	8.526	14.915	32.245	17.690	2.763
Extraction of minerals	337	11.573	8.605	20.772	47.478	9.792	1.780	53	5.660	5.660	16.981	66.038	5.661	.000
Manufacturing and mechanical industries	104,983	7.656	7.795	19.313	50.754	12.998	1.454	101,070	5.093	6.612	18.249	54.135	14.619	1.289
Transportation and communication	3,525	5.191	6.213	18.440	56.284	12.567	1.305	2,208	2.672	5.571	16.667	57.563	16.168	1.359
Trade	11,158	6.014	6.820	17.455	51.655	16.186	1.870	14,563	2.547	4.386	12.747	54.290	24.156	1.874
Public service (n. e. c.) [2]	966	4.969	3.416	16.977	51.863	19.875	2.899	930	1.720	2.796	8.602	53.441	30.860	2.581
Professional service	39,127	2.137	7.253	30.416	50.771	5.851	3.572	63,027	.944	4.749	28.650	52.818	12.222	.617
Domestic and personal service	740,631	5.248	5.465	15.906	50.100	20.032	3.249	1,152,570	4.080	5.207	15.899	52.379	20.059	2.376
Clerical occupations	5,301	7.746	12.345	30.430	43.393	5.734	.352	10,862	2.394	7.555	29.074	53.241	7.512	.221

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[1] Includes a negligible number of persons of unknown age.
[2] N. e. c.=Not elsewhere classified.

given by the clerical occupations; among the white girls there were 6 occupational groups above 10 percent each. Among the Negro boys, clerical occupations ranked first with 26 percent, followed by agriculture, forestry, and animal husbandry with 16 percent, while the Negro girls showed, as previously indicated, first place in agriculture, forestry, and animal husbandry with 26 percent. In 1930 the various child group percentages reveal decreases in both races, the white girls furnishing only 3 occupational groups above 10 percent.

The year 1920 showed the percentages for the various occupational groups among the middle-aged white workers to fluctuate from 3 percent in transportation and communication (4 percent in clerical occupations) to 29 percent in domestic and personal service; the corresponding range among the Negro workers was from 6 percent in clerical occupations to 20 percent in domestic and personal service. In general, the lapse of 10 years effected increases in the percentages of both races together with changes in the order of the occupational groups. Among the white workers the range became 7 to 35 percent, and among the Negroes, 6 to 31 percent, the upper limit being given, in each instance, by public service.

With respect to the white workers in the old-aged group, 65 years and over, the passage of 10 years resulted in an increase in all percentages; the corresponding changes among the Negro workers were slight decreases in the majority of occupational groups.

RATIO OF OBSERVED PERCENTAGE OF WORKERS IN EACH OCCUPATIONAL GROUP TO THE EXPECTED OR NORMAL PERCENTAGE

The percentage age distribution of all gainful female workers regardless of occupation but specific for color and census year may be assumed to be the "expected" or "normal" percentage age distribution for each occupational group of the corresponding color and census year. This assumption may be used in the examination of the question of whether there is an excess or dearth of workers in a particular occupational group specific for age, color, and census year. The ratio of an observed percentage to its corresponding normal percentage would indicate, when less than 1, a dearth of workers; when equal to 1, a normal percentage of workers; and when greater than 1, an excess of workers. The percentages constituting the four normal age distributions as defined, specific for color and census year, together with the corresponding observed percentages, are given in table 2.

Reference to the normal age distributions has already been made in the preceding section. The calculated ratios are shown in table 3, and figure 1 presents them graphically. The two broken lines in the figure drawn through 1.00 indicate the expected or normal levels of workers. The bars below or above a broken line show not only the presence of a dearth or an excess but also the magnitude of such dearth or excess.

TABLE 3.—*Ratio by age and color of percentage of gainful female workers in a specified occupational group to the percentage for all groups, 1920 and 1930 (percentages shown in table 2)*

Occupational group	Age group, 1920						Age group, 1930					
	10-17	18-19	20-24	25-44	45-64	65 and over	10-17	18-19	20-24	25-44	45-64	65 and over
	White											
Agriculture, forestry, animal husbandry	2.25	0.55	0.30	0.67	1.76	3.77	3.14	0.65	0.30	0.59	1.77	4.10
Extraction of minerals	1.52	1.07	.78	.98	.95	1.09	2.01	1.43	.85	.79	1.08	1.09
Manufacturing and mechanical industries	1.51	1.13	.89	.95	.91	.63	1.77	1.20	.92	.93	.89	.76
Transportation and communication	1.36	1.89	1.50	.75	.22	.11	1.05	1.59	1.38	.96	.38	.19
Trade	.97	1.02	.93	1.11	.88	.60	.85	.95	.82	1.10	1.13	.66
Public service (n. e. c.)[1]	.04	.25	.59	1.43	1.66	.96	.04	.04	.39	1.25	2.00	1.13
Professional service	.12	.68	1.32	1.24	.84	.50	.10	.53	1.19	1.19	.93	.63
Domestic and personal service	.56	.54	.57	1.06	1.90	2.20	.95	.76	.64	.93	1.61	2.02
Clerical occupations	.95	1.54	1.51	.93	.26	.09	.08	1.35	1.45	1.01	.37	.11
	Negro											
Agriculture, forestry, animal husbandry	1.92	1.15	0.91	0.79	0.87	0.91	2.56	1.38	0.92	0.68	0.91	1.18
Extraction of minerals	.87	1.32	1.29	1.07	.57	.65	.61	.92	1.04	1.40	.30	.00
Manufacturing and mechanical industries	.58	1.20	1.20	1.15	.76	.53	.55	1.07	1.12	1.15	.78	.55
Transportation and communication	.30	.95	1.15	1.27	.73	.48	.29	.90	1.03	1.22	.86	.58
Trade	.45	1.05	1.09	1.17	.94	.66	.27	.71	.78	1.15	1.28	.80
Public service (n. e. c.)[1]	.37	.52	1.06	1.17	1.16	1.06	.18	.45	.53	1.14	1.61	1.10
Professional service	.16	1.11	1.89	1.15	.52	.21	.10	.77	1.76	1.12	.65	.26
Domestic and personal service	.40	.84	.98	1.13	1.16	1.18	.44	.84	.98	1.11	1.07	1.01
Clerical occupations	.58	1.90	1.89	.98	.33	.13	.26	1.23	1.79	1.13	.40	.09

[1] N. e. c.=Not elsewhere classified.

Variability of the ratios in the different age groups. In passing from age group to age group figure 1 reveals striking differences in the variability of the ratios. A study of table 3 shows that in each census year the most stable age group among the white as well as among the Negro workers is 25-44 years; in the instance of the white workers, this group is followed in increasing order of magnitude, and in both census years, by the age groups 20 24, 18 19, 45 64, 10 17, and 65 and over. The Negro workers show, in general, less variability than the white workers; their age groups, when arranged in increasing order, differ from those of the white workers, and differ, moreover, from each other in the 2 census years. The old-aged group presents the greatest variability among the white workers in both census years, while the child group ranks similarly among the Negro workers in both census years, this phenomenon being influenced principally by agriculture, forestry, and animal husbandry.

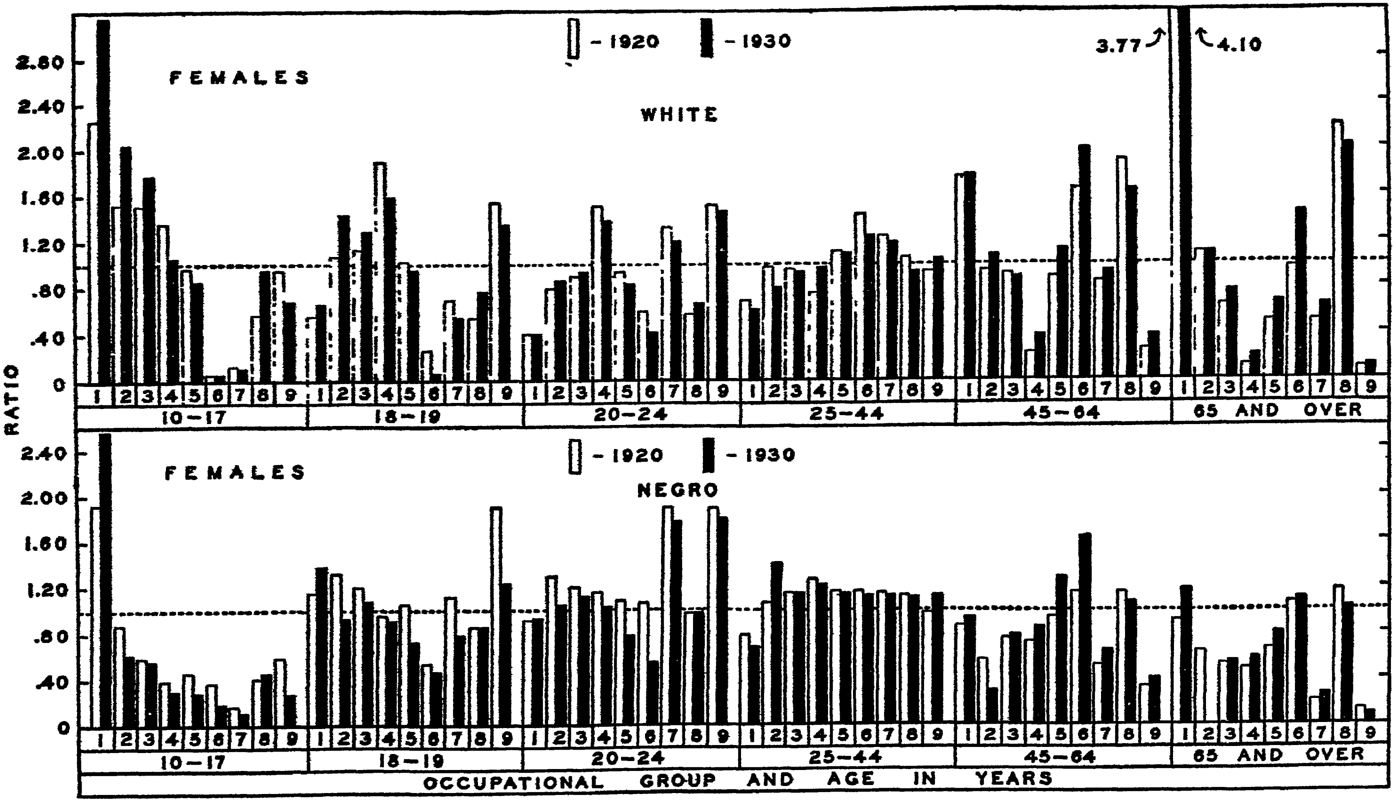

FIGURE 1.—Age-specific ratios of the percentages of gainful white and Negro female workers in different occupational groups to the percentages for all groups, 1920 and 1930. The numbers 1-9 are defined thus: 1, agriculture, forestry, and animal husbandry; 2, extraction of minerals; 3, manufacturing and mechanical industries; 4, transportation and communication; 5, trade; 6, public service (not elsewhere classified); 7, professional service; 8, domestic and personal service; and 9, clerical occupations.

Table 3 not only discloses notable differences in the variability of the ratios from age group to age group but it also shows that none of the occupational groups occupies consistently the same rank throughout all of the age groups under review. Thus, if the nine occupational groups were presented graphically, specific for color and census year, each of the four sets of graphs would show no orderliness but a crossing and recrossing of the curves representing the connected points of successive occupational group ratios. With respect to dearths and excesses of workers, it is of interest to refer at this time to certain race differences. Among these differences the most striking is presented by the child group, and in both census years. Thus, the white workers of this age group show four of the nine occupational groups with excesses while the Negroes show only one (agriculture, forestry, and animal husbandry). Moreover, the age groups 20-24 and 25-44 of 1920 show together 11 dearths out of a possible 18 among the white workers and 4 among the Negroes; in 1930 the corresponding figures are 11 and 5, respectively.

Age changes in the ratios.—Figures 2 and 3 show graphically for each census year how the age changes in the ratios of the different occupational groups compare with regard to color. In both figures the points corresponding to successive ratios of a particular occupational group have been connected to facilitate reading. The graphs immediately reveal that, first, the ratios of no occupational group lie consistently above or below the normal level of workers, each occupational group showing dearths and excesses of workers varying with age; second, no occupational group shows its graphs for the two races entirely separate, indicating that for a given occupational group, only particular age groups show dearths or excesses of workers of one race greater or less than those of the other race; third, the ranges of the ratios vary among the occupational groups, the greatest range being presented by agriculture, forestry, and animal husbandry, and minimum ranges by trade, and manufacturing and mechanical industries; and, finally, the trends of the ratios for 1930 are generally similar to the corresponding ratio trends for 1920.

As indicated in the previous papers (*2 4*) the trends of the age curves of the occupational group ratios may be classified into four categories depending upon when dearths and excesses of workers appear. Thus, an excess may be early and late with a dearth intervening; a dearth may be early and late with an excess intervening; a dearth may be early and followed later by an excess; or, an excess may appear early and be followed later by a dearth. These four categories correspond, respectively, to trends with the following configurations: U-shaped, inverted U-shaped, line with an ascending slope, and a line with a descending slope.

While the trends of the ratios for 1930 are generally similar to the corresponding ones for 1920, there are three occupational groups that show race differences with respect to ratio trends. The remaining six occupational groups show similar trends for both races.

The three occupational groups showing race differences in the trends of their ratios are extraction of minerals, manufacturing and mechanical industries, and transportation and communication. In these three groups the trends for the Negro workers describe an inverted U, with dearths appearing early and late and excesses intervening. The white workers, on the other hand, present ratios that form a U in the first occupational group, and trends with descending slopes in the second and third groups. The lapse of 10 years in the instance of the white workers in extraction of minerals and in manufacturing and mechanical industries effected an increase in the early excesses. The total number of reported Negroes in extraction of minerals in 1930 was 53, and hence the ratios derived from this figure must be accepted with some caution. While the ratios for the white workers in transportation and communication describe a descending trend, the excess for the child group is the smallest of all ratios, showing excesses in this occupational group. The situation is notably different among the white workers in manufacturing and mechanical industries where the maximum excess appears in the child group.

The remaining six occupational groups show similar trends for both races. These six groups are agriculture, forestry, and animal husbandry, trade, public service, professional service, domestic and personal service, and clerical occupations.

Agriculture, forestry, and animal husbandry, as in the instance of the males, may be assigned to the U category, recognizing at the same time the slight dearth among the Negroes in the age group 65 years and over. The passage of 10 years effected an increase in the excesses at both ends of the age scale, while the slight dearth among the Negroes became an excess.

Trade, professional service, and clerical occupations describe the inverted U, with dearths appearing early and late and excesses intervening. Notable race differences are the larger dearths among the Negroes of the child group in trade, and the larger excesses among the Negroes of age group 20 24 years in professional service and clerical occupations.

Public service, and domestic and personal service disclose increasing trends with age, a slight dearth appearing among the white workers of the old-aged group in public service. Noteworthy race differences in public service are the larger excesses among the white workers in the older age groups. Changes in this occupational group effected

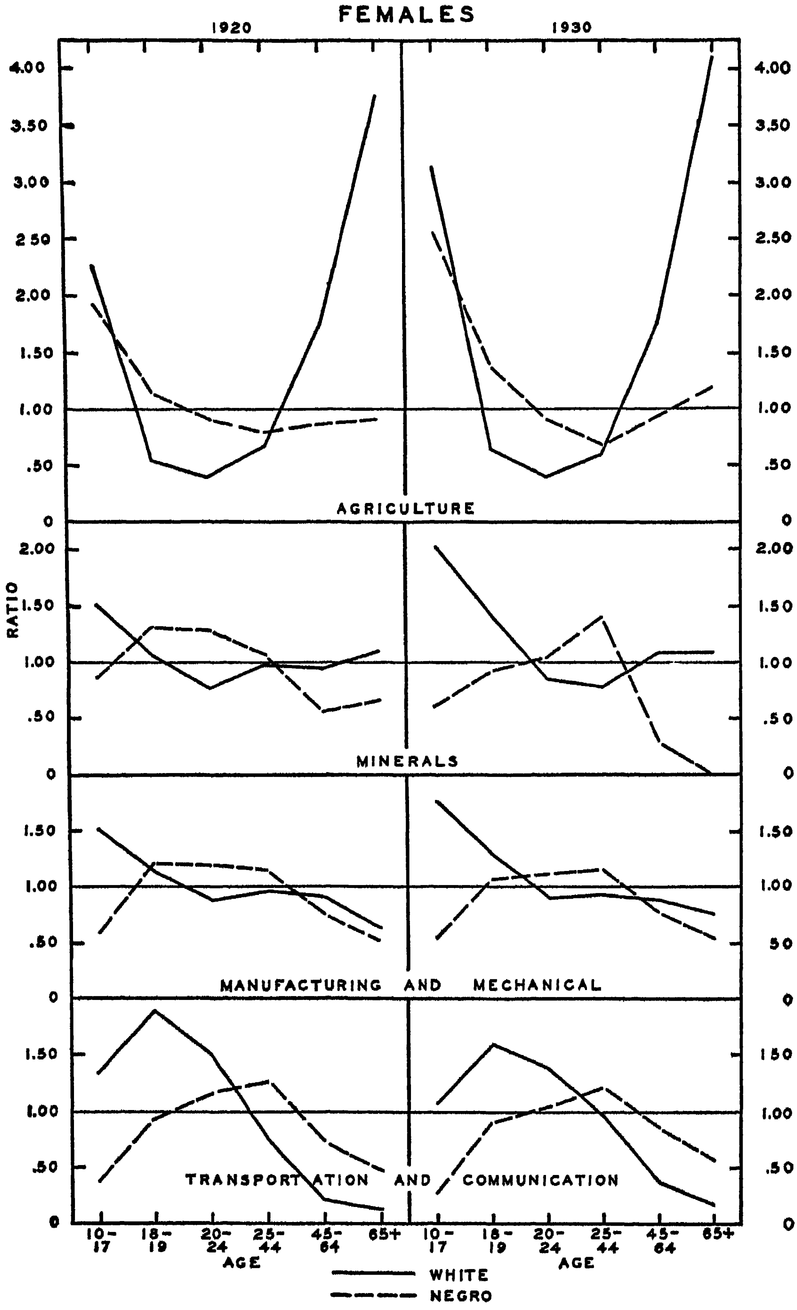

FIGURE 2.– Age-specific ratios of the percentages of gainful white and Negro female workers in different occupational groups to the percentages for all groups, 1920 and 1930; white and Negro female workers in specific occupational groups compared. (*Agriculture, forestry, and animal husbandry* is abbreviated *agriculture*, while *extraction of minerals* reads *minerals*. Points are joined by straight lines to facilitate reading.)

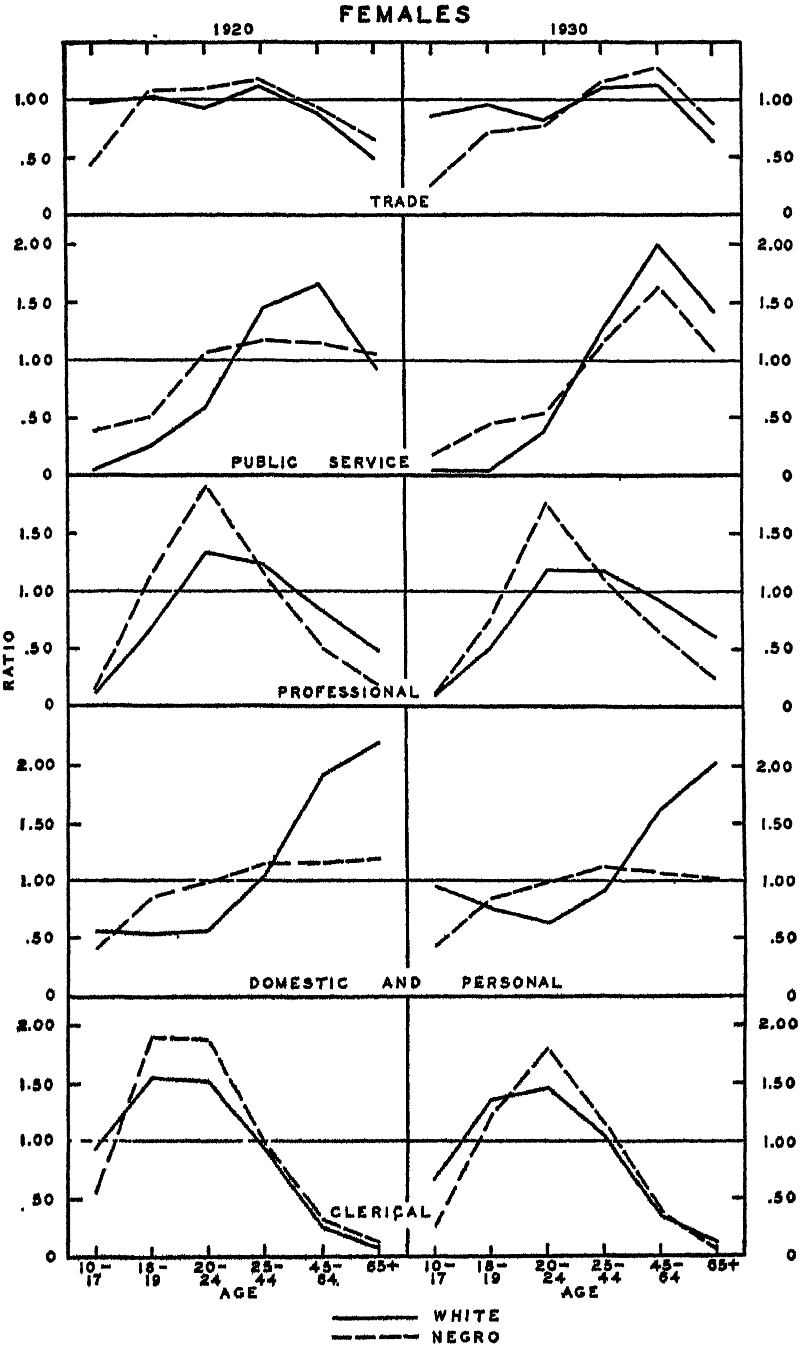

FIGURE 3.—Age-specific ratios of the percentages of gainful white and Negro female workers in different occupational groups to the percentages for all groups, 1920 and 1930; white and Negro female workers in specific occupational groups compared. (Points are joined by straight lines to facilitate reading.)

by the passage of 10 years are increases in the early dearths and later excesses, the slight dearth among the white workers of the old-aged group becoming an excess. Notable race differences in domestic and personal service occur in both years among the older ages, namely, the larger excesses among the white workers.

SUMMARY

This paper, the fifth of a series, investigates the age of gainful white and Negro female workers of the United States for the census years 1920 and 1930. The percentage age distribution of each of nine occupational groups is compared with the percentage age distribution of all gainful female workers by forming the ratios of corresponding percentages. The computed ratios, indicating excesses or dearths of workers, are specific for occupational group, age group, color, and census year. A brief summary of the results follows:

1. Differences in the trends of the ratios for the white and Negro workers, respectively, were found among the occupational groups.
2. Dearths and excesses of workers were shown by each occupational group to vary with age.
3. The passage of 10 years effected no notable change in the ratio trend of a given occupational group and race.
4. Race differences in the ratio trends for 1920 and 1930, respectively, were found only in extraction of minerals, manufacturing and mechanical industries, and transportation and communication.
5. Notable race differences were disclosed in each census year in certain of the age groups of specific occupational groups.

REFERENCES

(*1*) Gafafer, W. M.: (1937) Age of gainful workers of the United States, 1920 and 1930. Studies on the age of gainful workers no. 1. Pub. Health Rep., 52: 269-281. (Reprint No. 1806.)

(*2*) ————: (1937) Age of gainful male workers in different geographic regions of the United States, 1920 and 1930. Studies on the age of gainful workers no. 2 Ibid., 52: 437-453. (Reprint No. 1815)

(*3*) ————: (1937) Age of gainful female workers in different geographic regions of the United States, 1920 and 1930. Studies on the age of gainful workers no. 3. Ibid., 52: 730-748. (Reprint No. 1829.)

(*4*) ————: (1937) Age of gainful white and Negro male workers of the United States, 1920 and 1930. Studies on the age of gainful workers no. 4. Ibid., 52: 999-1011. (Reprint No. 1841.)

(*5*) U. S. Department of Commerce, Bureau of the Census. (1933) Fifteenth Census of the United States, 1930. Population, v. 5, General Report on Occupations. Government Printing Office, Washington, D. C. P. 114.

A STUDY OF THE VARIATIONS IN REPORTS ON HOSPITAL FACILITIES AND THEIR USE[1]

By JOSEPH W. MOUNTIN, *Surgeon*, ELLIOTT H. PENNELL, *Associate Statistician* and EMILY HANKLA, *United States Public Health Service*

Facilities represented by a hospital have been for many years an essential element in medical care, but they are now assuming increasing importance in programs of community health service. Because of this broadening base, hospital superintendents, practicing physicians, health officials, and persons concerned with community-service institutions all have occasion to consult data bearing on the existence of hospital facilities, their use, and the costs of operation. The items of information commonly used in expressing hospital accommodations and utilization are bed capacity, number of patients admitted, average daily census, and number of out-patient visits. These also constitute the bases for computing many of the unit costs of operation. For some time persons interested in hospital statistics and cost accounting have suspected that there must be some confusion in terms used by those responsible for the administrative records of hospitals, since data on facilities and use from similar hospitals were not comparable, and the reports of individual hospitals failed to check from year to year. The nature and extent of the discrepancies, however, were not fully understood. In an effort to clear up these points, the several national agencies concerned with collection of hospital statistics joined in requesting that the Public Health Service conduct an inquiry into the matter. It so happened that the information desired by all agencies was of particular interest to the Public Health Service, since the Service at the time was charged with conducting that part of the 1935 Census of American Business which pertained to hospitals.

The national agencies which normally compile hospital statistics kindly agreed to the use of their basic data. Surveys then in progress and others that had recently been completed furnished additional opportunities for securing from the same group of hospitals corresponding schedules which were suitable for comparative analysis. Random samples were selected from reports received by five of the agencies and matched, for each group in turn, with schedules from the sixth which were used as a basis for measuring the extent of variation. These five groups of reports and the agencies which received them are herein designated by the letters A, B, C, D, and E, and the sixth is known as the basic group or agency. The number of hospitals represented in study groups A, B, C, D, and E were 654, 304, 329, 701, and 379, respectively.

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[1] From the Division of Public Health Methods, National Institute of Health. Study conducted in connection with National Health Inventory.

The proportion of hospitals reporting with marked variations, the comparative amounts of discrepancies, and the effects of these differences on the totals were studied. Reports showing variations of less than 10 units per 100 in terms of the figures supplied by the basic agency were regarded as reasonably consistent. Differences of 10 to 19 and of 20 or more per 100 in reporting each item to the respective agencies were used in the first comparison. For the next, the average variation per 100 units reported to the basic agency was computed for each group of hospitals. In these computations the differences between the figures shown in comparative schedules from individual hospitals, without regard to whether they represented deficiencies or excesses, were summed and divided by the total units reported to the basic agency. A third comparison was made, by using ratios, of the total number of units for all hospitals combined, that is, beds, patients, or out-patient visits reported to the lettered agency and to the basic agency.

Comparisons for the total study were made of averages derived from figures on variation for the different groups of hospitals.

VARIATIONS BETWEEN HOSPITAL REPORTS FOR SPECIFIC ITEMS

BED CAPACITY

It was discovered that in figures on bed capacity 20 percent of the reports selected for comparison showed variations of 10 or more per 100 and that 10 percent showed variations of 20 or more. The extent of these differences by groups is shown in table 1. Although in the questionnaires sent out by agency D, hospitals were specifically requested to enter the same figures which slightly earlier had been given to the basic agency, about 13 percent of the reports in the D group varied more than 10, and 4 percent varied more than 20 beds per 100. For the five groups, the average divergence per 100 beds was about 7.

TABLE 1.—*Variations in bed capacity as reported to agencies A, B, C, D, and E and to a basic agency, portrayed by (1) percentage of hospital reports showing specified variations, (2) average variations per 100 hospital units, and (3) ratio between the total beds reported*

Reporting group	Percent of hospital reports showing specified variations		Average variations per 100 beds	Ratio between total beds reported
	10 to 19 beds per 100	20 or more beds per 100		
A	15	19	15	1.07
B	11	10	6	1.01
C	7	7	3	.98
D	9	4	6	1.00
E	10	8	6	.98
Average	10	10	7	1.01

Reports from mental and from tuberculosis hospitals were characterized by similarities both in the nature and in the extent of variations. Other types of special hospitals resembled general hospitals in these respects, whereas infirmary units of institutions were in a class by themselves. Consistency in reporting bed capacity appeared most frequently in the schedules from hospitals for mental and tuberculosis patients. The greatest variation, on the other hand, was evidenced by hospital units of institutions, which showed, for each 100 beds reported to the basic agency, an average discrepancy of 66. It is probable that at some times all beds in the institution were included, and at others, only those in the infirmary. For instance, a particular home for the aged and infirm reported to one agency 700 beds and to another 2,120.

Proprietary hospitals, including those owned by individuals, partners, and corporations unrestricted as to profit, were more often inconsistent in reporting bed capacity than were hospitals under control of voluntary nonprofit organizations or governmental agencies. This may have resulted in part from the fact that small hospitals predominated in the proprietary group.

Since it is commonly assumed that large hospitals are likely to be provided with better bookkeeping facilities and are more accustomed to making reports than small, it might also be expected that they would supply more consistent figures. The findings tend to support this assumption. In the groups under consideration, hospitals with less than 25 beds were responsible for the most frequent discrepancies in bed capacity, variations beyond the limit set for consistent reports occurring in more than one-third of the comparative entries. A distinct increase in agreement of reporting occurred in the hospitals with from 25 to 100 beds; further increase in agreement was found among those having 100 to 200, and slightly more between hospitals having 200 to 250 beds. Consistency did not, on the whole, however, become more evident in hospitals of over 250 beds. It seems possible that the effects of increases in bookkeeping efficiency which were apparent in hospitals of considerable size were nullified by the wide discrepancies in the reports of a few large institutions.

There appears to have been, in many instances, uncertainty in defining the terms "beds", "bassinets", and "cribs." Although the questionnaires differed in that those sent out by agencies C, D, and E requested the numbers of both beds and bassinets while those sent out by A and B omitted bassinets, each contained the specification that cribs should be included and bassinets excluded in entering bed capacity. Apparently, however, doubt still existed regarding distinctions to be made. It was found that 10 percent of the hospitals in group A and 6 percent in group B reported, on these questionnaires, bed capacities exactly equal to the sum of the bed and bassinet capacities reported to the basic agency.

While, as the foregoing discussion brings out, there is frequent and often wide divergence in reports on bed capacity by given hospitals to two agencies, the sum of the beds reported by a large group of hospitals may not vary to any considerable degree. A negative variation in one hospital report will frequently balance a positive variation in another. In the present instances, the ratios between the total numbers of beds reported by each group of hospitals to the agency designated by letter and to the basic agency averaged 1.01. It seems, therefore, that these figures would furnish satisfactory bases for comparisons of large groups of hospitals or for indicating general relationships. For calculations concerned with individual hospitals or with small, specialized groups, they cannot be recommended.

AVERAGE DAILY CENSUS

Greater discrepancies were shown in the reports on average daily census (total patient-days divided by 365) than in those on bed capacity. As is shown in table 2, the figures submitted by 37 percent of the hospitals contained variations of 10 or more per 100.

TABLE 2.—*Variations in average daily census as reported to agencies A, B, C, D, and E and to a basic agency, portrayed by (1) percentage of hospital reports showing specified variations, (2) average variations per 100 hospital units, and (3) ratio between the total daily census reported*

Reporting group	Percent of hospital reports showing specified variations		Average variations per 100 patients	Ratio between total average daily census reported
	10 to 19 patients per 100	20 or more patients per 100		
A	19	24	15	1.11
B	22	16	15	1.04
C	19	18	6	1.03
D	16	13	4	.99
E	23	12	7	1.00
Average	20	17	9	1.03

Mental and tuberculosis hospitals, which were on the whole more consistent than hospitals of other medical types in reporting bed capacity, were, comparatively speaking, less variable in regard to average daily census. Apparently a rapid turnover, such as occurs in general and special hospitals, may develop variances in determining the number of patients per day. Such estimates may be influenced by differences in counting days of admission and departure. The largest variations in reporting average daily census were found in schedules received from the hospital units of institutions. To cite an extreme case, an infirmary reported almost 10 times as high a number to one agency as to another. The average difference between comparative reports on daily census was 81 for each 100 patients.

Governmental hospitals were, of the several administrative types, most consistent in reporting daily census to each of the agencies. Their relatively large number of long-term patients may have been a contributing factor. Schedules from hospitals of the proprietary types exhibited the most marked differences in reports on this item. These are the hospitals with a rapid turnover.

The reporting of average daily census more than that of any other item was influenced by the size of the hospital. The proportion of comparative entries showing a satisfactory degree of consistency increased from about 40 percent for hospitals with 25 or fewer beds to about 80 percent for hospitals with more than 250 beds.

It should be noted that addition of the average daily census as reported by individual hospitals to companion agencies resulted in totals with an average ratio of 1.03. Presumably, these totals should be sufficiently accurate to be used in general comparisons involving large groups of hospitals.

PATIENTS ADMITTED

Total number of patients admitted to hospitals during the period under consideration was reported to four study groups as is shown in table 3. Variations of 10 or more patients per 100 were found in the numbers furnished by 47 percent of the hospitals, while the average divergence on this item was 12.

TABLE 3.—*Variations in total number of patients admitted as reported to agencies A, B, C, and E and to a basic agency, portrayed by (1) percentage of hospital reports showing specified variations, (2) average variations per 100 hospital units, and (3) ratio between the total patients reported*

Reporting group	Percent of hospital reports showing specified variations		Average variations per 100 patients	Ratio between total patients reported
	10 to 19 patients per 100	20 or more patients per 100		
A	18	32	18	1.11
B	21	14	10	.99
C	20	26	6	1.05
E	25	25	14	1.08
Average	23	24	12	1.06

General and special hospitals reported relatively similar figures for total number of patients far more frequently than did mental hospitals or the hospitals connected with institutions. In hospitals of the latter types, a variation of 20 patients or more per 100 occurred in the reports of three-fifths of these hospitals, while 14 reported over five times as many patients to agency A as to the basic agency. The wording of the questionnaires sent out by these two agencies and by agency B was almost identical. All asked for total patients admitted excluding infants and out-patients The A and B blanks, however, were accompanied by instructions which specified that patients admitted should include those in the hospital on the first day of the report period. Agency E asked for the total patients treated. Since, according to the data received by the basic agency, the average daily census for mental and tuberculosis hospitals was often higher than the total number of patients admitted during a year, it seems probable that in many cases only the new patients were reported to this organization. A considerable degree of variability in the reports on number of patients is thus explained, as frequently those on roll at the beginning of the year constitute a major proportion of the total patients served.

Differences in questionnaires, however, do not by any means completely account for the variation in reporting number of patients, for while the larger number was given more frequently to one of the others than to the basic agency, this was not always true About a third of the hospitals in each group reported fewer patients to the agency which specified that all patients treated be included than to the basic agency which asked for patients admitted.

Institutional hospitals, which also have a high carry-over of patients from one year to the next, afford an additional chance for inconsistent reporting. In some instances only patients given medical examination or treatment in the infirmary are reported; in others all residents of the institution are included. In fact, for a certain orphanage 20 times as many patients admitted were entered in the schedule of the basic agency as in that of agency B.

With such differences existing in the reports from mental, tuberculosis, and institutional hospitals, a majority of which are under governmental supervision, it is not surprising that more frequent and pronounced variations in number of patients were found in combined reports from governmental hospitals than in those from proprietary or nonprofit hospitals.

Hospitals with less than 200 beds seem to have been, on the whole, considerably more consistent in reporting total number of patients to agencies used for comparison than were the larger ones. The latter group was weighted with mental and institutional hospitals.

Some consolation for the hospital statistician was found in the fact that the ratios between the totals reported to the lettered agencies and to the basic agency averaged about 1.06, thus indicating that comparative analyses involving total numbers of patients for large groups of hospitals may be made with relative safety.

OUT-PATIENT VISITS [2]

Variations of 10 or more visits per 100 from the basic agency figures were found in almost half of the out-patient visit reports furnished by two of the lettered agencies, C and D (see table 4). Those from hospitals classified as general and special showed a higher average rate of consistency than those from hospitals for mental or tuberculosis patients. The data did not indicate that size or type of administrative control of the hospital influenced variations.

TABLE 4.—*Variations in number of out-patient visits as reported to agencies C and D and to a basic agency, portrayed by (1) percentage of hospital reports showing specified variations, (2) average variations per 100 hospital units, and (3) ratio between the total out-patient visits reported*

Reporting group	Percent of hospital reports showing specified variations		Average variations per 100 visits	Ratio between total out-patient visits reported
	10 to 19 visits per 100	20 or more visits per 100		
C	17	30	5	0.98
D	14	25	8	1.00
Average	15	27	6	.99

Neither of the terms "out-patient" nor "out-patient visit" has a well-defined connotation in hospital statistics. In some institutions it seems that the term "out-patient" is used to describe all visits to the hospital by ambulatory patients; at other places it is applied solely to attendance at an organized out-patient department. Hospitals of very small size frequently exist as adjuncts to the regular practice of the physician-superintendents, whose offices are in the same building. Under such circumstances, office calls may be entered in the out-patient classification. Certain small hospitals reporting remarkably large numbers of out-patient visits were found to be including under that heading all calls made by staff physicians to patients in their homes.

Even where an organized out-patient department exists, there is a definite chance for differences in interpretation of terminology involved. In some large hospitals, follow-up clinics, separate from the out-patient departments, take care of patients who require attention after leaving the hospital. Recipients of this type of ambulatory service may or may not be included as out-patients. An additional source of discrepancy is represented by the patient who, during a single trip to the out-patient department, is served in several clinics, thus making possible a count of one or of several visits.

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[2] Out-patient data were submitted by 2 lettered agencies and by the basic agency.

COMPARISON OF GROUPS

Inspection of the foregoing tables shows that the highest percentage of variation in entering all items was evidenced by hospitals reporting to agency A. It so happens that hospitals reporting to this agency differed, as a class, from those in the other groups by being smaller, more often proprietary in control, and more frequently institutional in character.

REPORT PERIOD

Time periods covered by reports to be compared were not always identical; neither were they sufficiently divergent to allow for appreciable changes in hospital capacity or occupancy. No constant relationship could be discovered between coincidence of report period and consistency of reports.

SUMMARY

A growing interest in hospital statistics, especially those which relate to the existence and use of facilities, has brought into relief discrepancies between the figures assembled by several national agencies. It was, therefore, suggested by the agencies that the United States Public Health Service conduct an inquiry into the magnitude and nature of these differences. According to common agreement, inquiry was confined to four basic items of administrative importance; namely, bed capacity, number of patients admitted, average daily census, and number of out-patient visits.

The item reported with the most consistency was bed capacity; yet in the figures submitted by one-fifth of the hospitals, there were found differences of 10 or more beds per 100. Uncertainty in the use of the terms "beds", "bassinets", and "cribs" seemed to encourage discrepancies. Variations in average daily census of at least 10 patients per 100 were shown by more than a third of the hospitals, while equal discrepancies occurred in about half of the reports on total number of patients admitted. In many cases only new admissions were reported to one agency while patients remaining in the hospital at the beginning of the report period and new patients admitted during the period were included in the total given to the other agency. Inconsistencies of 10 or more per 100 occurred in nearly half of the reports on out-patient visits.

Institutional hospitals were especially variable in reporting all items. It seems likely that, in some instances, the infirmary beds or patients were given, and in others all beds or inmates of the institution. Hospitals for mental and for tuberculosis patients sent in more constant figures on bed capacity and daily census than hospitals with a higher patient turn-over. In reporting number of patients, however, these hospitals showed a high degree of variation which seemed to result, in part at least, from different practices with regard to inclusion of patients who were in the hospital at the beginning of the report period.

There was some evidence to suggest that where other factors are similar large hospitals are more likely than small ones to report consistently and that, on the whole, this tendency increased with size.

It would appear from the relationships indicated by these data that an important cause of inconsistencies in reports is uncertainty in the use of terms. Uniform definitions would eliminate much perplexity both on the part of hospitals in preparing reports and on the part of agencies in analyzing the data. The use of uniform definitions would also enable one agency to use the data of another and thus reduce the number of requests for information.

Mere agreement among the agencies in the type of schedule does not insure uniform interpretation by the hospitals. Wide variations were shown in the reporting of items which were requested in the same words by different agencies. It is necessary that complete and uniform instructions be given to hospitals, and that administrators observe these instructions in detail.

At the present time, because of inconsistencies that have been revealed by this analysis of hospital data, conclusions regarding the existence and use of facilities are likely to be well founded only when based on totals for large groups of institutions. Comparisons between hospitals had better await the development of greater consistency than that which now obtains in their reports. Because of this variability in base, the same caution is equally applicable regarding the use of data bearing on capital investment and operating costs.

DEATHS DURING WEEK ENDED DECEMBER 18, 1937

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Dec 18, 1937	Corresponding week, 1936
Data from 86 large cities in the United States:		
Total deaths	8,946	9,247
Average for 3 prior years	8,641	
Total deaths, first 50 weeks of year	428,436	429,021
Deaths under 1 year of age	515	559
Average for 3 prior years	549	
Deaths under 1 year of age, first 50 weeks of year	27,388	27,661
Data from industrial insurance companies:		
Policies in force	69,981,599	68,924,487
Number of death claims	12,650	13,208
Death claims per 1,000 policies in force, annual rate	9.4	10.0
Death claims per 1,000 policies, first 50 weeks of year, annual rate	9.7	9.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (------) indicate that cases or deaths may have occurred although none was reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Dec. 25, 1937, and Dec. 26, 1936

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Dec. 25, 1937	Week ended Dec. 26, 1936	Week ended Dec. 25, 1937	Week ended Dec. 26, 1936	Week ended Dec. 25, 1937	Week ended Dec. 26, 1936	Week ended Dec. 25, 1937	Week ended Dec. 26, 1936
New England States:								
Maine	--------	3	--------	6	22	21	1	0
New Hampshire	--------	--------	--------	--------	27	2	1	0
Vermont	--------	1	--------	--------	138	--------	0	0
Massachusetts	7	4	--------	--------	68	438	0	0
Rhode Island	--------	--------	--------	--------	3	28	0	0
Connecticut	6	1	--------	4	4	119	1	1
Middle Atlantic States:								
New York	23	23	[1] 6	[1] 36	71	100	5	8
New Jersey [2]	5	7	6	10	319	119	0	1
Pennsylvania	26	12	--------	--------	3,090	9	6	0
East North Central States:								
Ohio	18	20	9	4	395	16	5	4
Indiana	24	10	31	93	44	7	0	5
Illinois	40	30	19	104	1,030	7	8	4
Michigan	11	17	1	4	251	29	1	0
Wisconsin	1	18	35	116	103	30	0	2
West North Central States:								
Minnesota	3	5	--------	--------	3	8	0	3
Iowa	4	4	5	28	9	1	2	1
Missouri	22	10	60	50	746	2	1	1
North Dakota	--------	2	1	--------	--------	--------	0	0
South Dakota	--------	--------	--------	1	--------	1	0	0
Nebraska	2	2	--------	--------	2	2	0	0
Kansas	10	3	4	1	59	7	2	0
South Atlantic States:								
Delaware	--------	3	--------	--------	3	52	0	0
Maryland [3]	12	21	12	14	5	77	3	2
District of Columbia	5	5	5	1	8	5	0	2
Virginia	30	23	--------	--------	77	38	3	1
West Virginia	11	24	44	47	122	20	2	5
North Carolina	21	39	7	14	242	5	1	1
South Carolina [3]	3	10	95	206	7	15	0	0
Georgia [3]	17	24	--------	86	--------	--------	0	2
Florida [2] [3]	14	8	6	--------	30	1	2	3
East South Central States:								
Kentucky	7	18	16	15	94	17	8	8
Tennessee	9	28	50	45	187	21	2	1
Alabama [3]	27	23	170	53	19	2	9	1
Mississippi [2]	5	6	--------	--------	--------	--------	3	2

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Dec. 25, 1937, and Dec. 26, 1936—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Dec 25, 1937	Week ended Dec 26, 1936	Week ended Dec 25, 1937	Week ended Dec 26, 1936	Week ended Dec 25, 1937	Week ended Dec 26, 1936	Week ended Dec 25, 1937	Week ended Dec 26, 1936
West South Central States:								
Arkansas	5	7	38	35	50	3	0	2
Louisiana	6	13	50	7	2	2	2	1
Oklahoma [4]	23	11	149	98	9	5	4	3
Texas	50	67	493	756	77	137	4	5
Mountain States								
Montana	------	1	------	35	4	2	0	0
Idaho	1	------	1	5	13	63	0	1
Wyoming	------	------	------	------	1	------	0	1
Colorado	11	4	------	------	73	5	0	0
New Mexico	3	------	4	6	78	22	0	0
Arizona	2	2	76	78	------	4	0	0
Utah [3]	4	------	------	------	38	4	1	0
Pacific States:								
Washington	5	3	------	------	19	16	0	0
Oregon	------	------	71	25	10	3	1	1
California	26	43	35	45	26	19	3	3
Total	499	568	1,409	2,088	7,581	1,541	81	75
51 weeks of year	27,196	28,079	290,164	156,037	291,343	281,582	5,307	7,202

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Dec 25, 1937	Week ended Dec 26, 1936	Week ended Dec 25, 1937	Week ended Dec 26, 1936	Week ended Dec 25, 1937	Week ended Dec. 26, 1936	Week ended Dec 25, 1937	Week ended Dec 26, 1936	Week ended Dec. 25, 1937
New England States:									
Maine	0	0	8	10	0	0	1	1	11
New Hampshire	0	0	8	4	0	0	0	0	1
Vermont	0	0	2	8	0	0	0	0	31
Massachusetts	0	0	193	153	0	0	1	1	83
Rhode Island	0	0	28	5	0	0	0	0	18
Connecticut	0	0	76	49	0	0	0	0	20
Middle Atlantic States:									
New York	0	0	350	402	0	21	4	5	240
New Jersey [3]	0	0	47	71	0	0	1	0	77
Pennsylvania	1	0	387	85	0	0	16	3	245
East North Central States:									
Ohio	0	0	264	215	4	5	1	5	43
Indiana	0	0	126	128	55	5	3	1	18
Illinois	0	1	509	327	35	0	1	0	46
Michigan	0	1	344	301	2	0	2	7	114
Wisconsin	0	0	141	258	10	7	1	0	146
West North Central States:									
Minnesota	3	0	93	114	17	8	1	3	19
Iowa	0	0	228	102	38	7	0	4	22
Missouri	1	0	174	104	26	9	5	6	32
North Dakota	0	0	22	60	5	13	0	2	23
South Dakota	1	0	18	62	2	5	0	0	2
Nebraska	1	0	27	46	1	10	0	0	10
Kansas	1	0	132	234	8	6	1	1	81
South Atlantic States:									
Delaware	0	0	16	8	0	0	0	0	3
Maryland [3]	0	0	49	59	0	0	3	4	57
District of Columbia	0	0	8	12	0	0	1	1	3
Virginia	0	1	35	26	0	0	6	5	87
West Virginia	1	0	61	63	1	0	3	7	40
North Carolina	0	0	36	31	0	0	1	2	127
South Carolina [3]	0	0	2	8	0	0	4	0	6
Georgia [3]	1	1	18	20	0	0	1	5	8
Florida [2] [3]	0	1	------	1	0	0	8	0	9

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Dec. 25, 1937, and Dec. 26, 1936—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Dec. 25, 1937	Week ended Dec. 26, 1936	Week ended Dec. 25, 1937	Week ended Dec. 26, 1936	Week ended Dec. 25, 1937	Week ended Dec. 26, 1936	Week ended Dec. 25, 1937	Week ended Dec. 26, 1936	Week ended Dec. 25, 1937
East South Central States:									
Kentucky	0	0	60	58	14	0	0	2	15
Tennessee	1	3	32	38	0	0	1	11	23
Alabama [3]	1	1	23	15	1	0	9	7	35
Mississippi [2]	5	0	3	10	2	0	1	0	--------
West South Central States:									
Arkansas	0	1	6	16	1	0	0	1	13
Louisiana	2	1	7	12	0	0	6	2	14
Oklahoma [4]	2	3	70	36	1	0	2	5	20
Texas	2	3	113	112	5	3	12	13	178
Mountain States:									
Montana	0	0	24	39	21	16	1	0	39
Idaho	1	0	18	26	24	3	1	0	13
Wyoming	0	0	4	6	3	0	0	0	11
Colorado	0	0	51	24	9	1	1	0	8
New Mexico	0	0	32	17	0	0	0	10	20
Arizona	0	0	9	8	0	0	0	0	13
Utah [2]	0	0	62	8	2	0	0	0	5
Pacific States:									
Washington	1	0	49	80	17	4	1	1	64
Oregon	0	0	32	27	6	18	2	0	28
California	0	4	140	214	11	11	6	8	220
Total	25	21	4,137	3,721	321	152	103	123	2,286
51 weeks of year	9,416	4,473	218,448	227,903	10,765	7,296	14,930	14,510	--------

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[1] New York City only.

[2] Week ended earlier than Saturday.

[3] Typhus fever, week ended Dec. 25, 1937, 25 cases, as follows: South Carolina, 1; Georgia, 12; Florida, 2; Alabama, 10.

[4] Figures for 1936 exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
October 1937										
Puerto Rico	2	54	95	4,449	61	------	0	0	0	37
November 1937										
Illinois	11	206	63	19	1,364	1	26	1,589	37	41
Kansas	2	50	8	-------	77	-------	4	482	8	5
Maryland	13	98	24	1	29	1	1	310	0	23
Montana	1	5	180	-------	57	-------	-------	123	99	8
Nevada	-------	-------	5	-------	4	-------	1	15	0	0
New Mexico	-------	27	6	8	190	1	3	111	0	33
North Dakota	1	3	-------	-------	10	-------	1	166	75	2
Oklahoma	6	118	143	75	9	3	8	275	11	56
Oregon	1	28	88	-------	42	-------	11	104	51	4
Rhode Island	2	6	-------	-------	8	-------	3	114	0	1
South Dakota	1	12	9	-------	9	-------	5	105	27	6
Texas	5	233	860	802	104	65	16	412	9	170
Virginia	17	188	300	6	226	5	3	166	0	23
Washington	4	17	13	-------	96	-------	13	157	82	19

Summary of monthly reports from States—Continued

October 1937

	Cases
Puerto Rico:	
Chicken pox	30
Dysentery	28
Filariasis	3
Mumps	6
Puerperal septicemia	6
Tetanus	5
Tetanus, infantile	3
Whooping cough	89

November 1937

	Cases
Botulism:	
New Mexico	14
Chicken pox:	
Illinois	1,796
Kansas	733
Maryland	416
Montana	246
Nevada	34
New Mexico	55
North Dakota	141
Oklahoma	112
Oregon	233
Rhode Island	110
South Dakota	182
Texas	189
Virginia	258
Washington	670
Conjunctivitis:	
Oklahoma	4
Dengue:	
Texas	12
Diarrhea:	
Maryland	11
New Mexico (enteritis included)	22
Dysentery:	
Illinois (amoebic)	2
Illinois (bacillary)	57
Maryland (bacillary)	14
Montana	1
New Mexico (amoebic)	1
New Mexico (bacillary)	2
New Mexico (unspecified)	9
Oklahoma	1
Oregon	1
Rhode Island (bacillary)	1
Texas (amoebic)	1
Texas (bacillary)	72
Virginia (diarrhea included)	27
Washington (amoebic)	2
Washington (bacillary)	3
Encephalitis, epidemic or lethargic:	
Illinois	10
Maryland	2
Montana	1
Rhode Island	1
South Dakota	1
Texas	4
Washington	2
German measles:	
Illinois	40
Kansas	11
Maryland	4
Montana	7
New Mexico	1
Rhode Island	5
Washington	14
Impetigo contagiosa:	
Illinois	12
Maryland	50
Montana	16
Oregon	113
Washington	11
Jaundice, infectious:	
Oregon	17
Milk sickness:	
Illinois	10
Mumps:	
Illinois	313
Kansas	119
Maryland	26
Montana	39
Nevada	21
New Mexico	22
North Dakota	2
Oklahoma	12
Oregon	42
Rhode Island	16
South Dakota	14
Texas	30
Virginia	60
Washington	474
Ophthalmia neonatorum:	
Illinois	8
Maryland	1
Montana	1
New Mexico	1
Oklahoma	3
Virginia	1
Paratyphoid fever:	
Illinois	4
Kansas	4
Maryland	1
Texas	5
Puerperal septicemia:	
New Mexico	2
Rabies in animals:	
Illinois	35
Oregon	3
Washington	10
Rabies in man:	
Illinois	1
Scabies:	
Kansas	2
Maryland	2
Montana	5
Oregon	117
Septic sore throat:	
Illinois	10
Kansas	2
Maryland	4
Montana	13
Septic sore throat—Contd.	
New Mexico	2
North Dakota	1
Oklahoma	15
Oregon	6
Rhode Island	10
South Dakota	1
Virginia	30
Washington	1
Tetanus:	
Illinois	4
New Mexico	1
Oklahoma	1
Trachoma:	
Illinois	3
Maryland	1
Montana	8
Oklahoma	5
South Dakota	1
Washington	7
Tularaemia:	
Illinois	3
Kansas	2
Maryland	2
Montana	1
Nevada	1
Oregon	1
Texas	5
Virginia	3
Typhus fever:	
Texas	25
Virginia	3
Undulant fever:	
Illinois	10
Kansas	3
Maryland	8
Oklahoma	113
Rhode Island	2
Texas	16
Virginia	2
Washington	4
Vincent's infection:	
Illinois	11
Kansas	6
Maryland	12
Montana	1
North Dakota	3
Oklahoma	8
Oregon	12
South Dakota	1
Whooping cough:	
Illinois	309
Kansas	267
Maryland	324
Montana	90
New Mexico	216
North Dakota	42
Oklahoma	423
Oregon	112
Rhode Island	150
South Dakota	106
Texas	511
Virginia	232
Washington	350

WEEKLY REPORTS FROM CITIES

City reports for week ended Dec. 18, 1937

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	260	1,057	115	979	824	1,417	11	369	30	917	--------
Current week [1]	165	230	70	2,097	753	1,177	30	339	26	912	--------
Maine:											
Portland	0	1	0	0	2	1	0	0	0	7	20
New Hampshire:											
Concord	0	------	0	28	1	0	0	0	0	4	7
Manchester	0	------	0	0	3	0	0	0	0	0	11
Nashua	0	------	0	1	0	1	0	0	0	0	5
Vermont:											
Barre	--------	------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Burlington	0	------	0	0	0	0	0	0	1	3	6
Rutland	0	------	0	1	0	0	0	0	0	0	10
Massachusetts:											
Boston	0	------	1	22	19	58	0	7	6	11	217
Fall River	0	------	0	0	9	2	0	3	0	52	35
Springfield	0	------	0	1	1	4	0	2	0	21	25
Worcester	0	------	0	0	6	5	0	2	0	11	51
Rhode Island:											
Pawtucket	0	------	0	0	0	5	0	0	0	0	12
Providence	0	------	0	1	6	10	0	2	0	26	75
Connecticut:											
Bridgeport	0	------	0	0	4	14	0	2	0	0	38
Hartford	0	------	0	2	1	6	0	0	0	8	56
New Haven	0	------	0	0	0	0	0	0	0	2	41
New York:											
Buffalo	0	------	0	3	11	15	0	7	0	13	147
New York	41	10	5	23	89	132	0	77	2	140	1,422
Rochester	0	------	0	0	4	6	0	0	0	1	70
Syracuse	0	------	0	0	4	11	0	1	1	10	45
New Jersey:											
Camden	1	------	0	3	2	6	0	1	0	0	34
Newark	0	3	1	4	15	15	0	3	0	32	85
Trenton	0	------	0	171	2	4	0	2	0	2	39
Pennsylvania:											
Philadelphia	3	6	6	38	31	94	0	22	3	45	462
Pittsburgh	4	6	3	331	31	47	0	10	0	27	217
Reading	0	------	0	0	0	4	0	0	0	1	19
Scranton	2	------	--------	13	--------	3	0	--------	0	2	--------
Ohio:											
Cincinnati	3	------	3	2	17	16	0	2	0	6	140
Cleveland	1	17	1	108	22	33	0	7	0	29	200
Columbus	2	---	0	6	6	7	0	3	0	3	72
Toledo	0	3	2	43	9	8	0	4	0	7	71
Indiana:											
Anderson	0	------	0	0	2	6	0	0	0	0	13
Fort Wayne	2	------	0	1	4	1	0	0	0	0	30
Indianapolis	3	------	1	2	21	15	0	4	0	4	134
Muncie	0	------	0	2	3	2	0	0	0	0	12
South Bend	0	------	0	0	9	3	0	0	0	0	19
Terre Haute	0	------	0	1	0	1	0	0	0	0	27
Illinois:											
Alton	0	------	0	22	0	4	0	0	0	0	5
Chicago	11	18	3	201	55	104	0	42	0	25	722
Elgin	1	------	0	0	1	10	0	0	0	8	13
Moline	0	------	0	15	1	20	0	0	0	3	3
Springfield	0	------	0	2	3	9	2	0	0	2	19
Michigan:											
Detroit	7	1	0	118	35	108	0	12	2	41	313
Flint	--------	------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Grand Rapids	0	------	0	1	5	32	0	1	0	8	38
Wisconsin:											
Kenosha	0	------	0	3	0	4	0	0	0	0	4
Madison	0	------	0	0	1	0	0	0	0	1	19
Milwaukee	0	1	1	118	12	13	0	2	0	14	127
Racine	0	------	0	3	0	4	0	0	0	2	12
Superior	0	------	0	0	0	1	0	0	0	0	7

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[1] Figures for Barre, Vt., and Flint, Mich., estimated; reports not received.

City reports for week ended Dec. 18, 1937—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	----	0	0	2	4	0	1	0	13	10
Minneapolis	0		0	0	6	10	0	0	0	2	112
St. Paul	0	-	0	0	2	9	14	1	0	3	43
Iowa:											
Cedar Rapids	0	-	----	2	-----	0	0	------	0	3	--------
Davenport	1	-	-----	0	------	3	0	------	0	0	--------
Des Moines	2	-	------	0	----	27	1	------	0	0	39
Sioux City	0	--	------	0	-	1	0	------	0	0	--------
Waterloo	0	-	------	1	0	4	0	-------	0	2	--------
Missouri:											
Kansas City	1	-----	0	7	11	12	0	3	1	2	102
St. Joseph	2	-----	0	0	3	2	0	0	0	0	41
St. Louis	10	------	1	598	13	49	2	2	0	3	211
North Dakota:											
Fargo	0	----	0	0	2	1	0	0	0	5	9
Grand Forks	0	----	--	0	---	2	0	-------	0	0	--------
Minot	0		0	0	0	0	0	0	0	5	8
South Dakota:											
Aberdeen	0	---	--	0	------	3	0	-----	0	8	--------
Nebraska:											
Lincoln	1	----	0	0	0	1	0	0	0	0	23
Omaha	0	-	0	0	4	2	0	0	0	0	49
Kansas:											
Lawrence	0	1	0	0	1	0	0	0	0	3	5
Topeka	0	---	0	0	3	2	0	0	0	10	28
Wichita	0		0	0	2	3	0	1	0	3	16
Delaware:											
Wilmington	0	-----	0	0	5	5	0	0	0	1	31
Maryland:											
Baltimore	17	11	2	2	21	21	0	10	1	47	220
Cumberland	0	---	0	0	2	0	0	0	0	2	12
Frederick	0	----	0	0	0	0	0	0	0	0	1
Dist. of Columbia:											
Washington	10	--	0	6	9	16	0	10	0	10	180
Virginia:											
Lynchburg	1	--	0	4	5	1	0	0	0	1	13
Norfolk	0	--	2	1	10	8	0	0	0	1	38
Richmond	1		1	0	8	7	0	2	0	0	63
Roanoke	0	----	0	1	0	1	0	1	0	0	20
West Virginia:											
Charleston	1	5	1	3	11	2	0	1	2	0	40
Huntington	0	------	0	0	------	1	0	-----	0	0	--------
Wheeling	0	------	0	1	2	5	0	0	0	3	16
North Carolina:											
Gastonia	0	---	-------	0	-------	0	0	-------	0	1	--------
Raleigh	0	----	0	0	1	1	0	0	0	20	12
Wilmington	1	----	0	0	2	0	0	0	0	3	16
Winston-Salem	1	-	0	0	6	4	0	0	0	11	24
South Carolina:											
Charleston	0	57	1	2	5	5	0	0	1	0	26
Florence	0	--	0	1	2	0	0	1	0	0	16
Greenville	0	-	0	0	0	1	0	0	0	3	1
Georgia:											
Atlanta	0	37	4	84	13	9	0	4	0	5	112
Brunswick	0		0	0	1	0	0	0	0	0	5
Savannah	0	4	2	0	6	0	0	1	0	0	43
Florida:											
Miami	3	2	2	24	5	0	0	1	0	1	43
Tampa	4	1	0	2	3	3	0	2	0	0	25
Kentucky:											
Covington	1	------	0	0	3	4	0	1	0	0	22
Louisville	1	3	2	26	17	17	0	3	0	11	119
Tennessee:											
Knoxville	0	------	2	0	4	1	0	3	0	1	31
Memphis	1	------	2	87	7	11	0	3	0	2	85
Nashville	0	------	0	0	5	2	0	2	0	2	62
Alabama:											
Birmingham	0	28	4	9	10	2	0	5	0	0	81
Mobile	0	------	0	0	5	3	0	0	0	0	27
Montgomery	2	2	--------	0	-------	1	0	-------	0	1	--------
Arkansas:											
Fort Smith	0	------	--------	0	-------	4	0	-------	0	0	--------
Little Rock	1	------	0	25	1	4	0	2	0	0	--------

City reports for week ended Dec. 18, 1937—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	2		0	0	0	0	0	0	0	0	3
New Orleans	17	15	7	1	18	7	0	15	0	10	178
Shreveport	0	----	1	0	9	2	0	3	0	0	43
Oklahoma:											
Muskogee	1	------	------	0	---	1	0	---	0	0	--
Oklahoma City	0	----	0	0	2	0	0	2	0	0	42
Tulsa	4	----	------	0	------	7	3	------	0	18	----
Texas:											
Dallas	3	2	2	0	15	7	0	5	0	2	77
Fort Worth	2	------	1	0	7	0	0	1	0	0	41
Galveston	0	----	0	0	3	1	0	0	0	0	16
Houston	2	------	2	0	15	1	0	8	0	0	98
San Antonio	0	------	6	0	10	0	0	4	2	4	77
Montana:											
Billings	0	------	0	0	2	0	0	0	0	0	10
Great Falls	0	-----	0	0	2	1	2	0	0	15	10
Helena	0	------	0	0	0	1	0	0	0	5	4
Missoula	0	------	0	0	4	2	0	0	0	0	12
Idaho:											
Boise	0	------	0	0	1	0	4	0	0	0	9
Colorado:											
Colorado Springs	0	------	0	1	0	5	0	4	0	0	13
Denver	5	------	0	52	10	17	0	3	2	4	91
Pueblo	0	------	0	0	0	2	1	0	1	3	9
New Mexico:											
Albuquerque	0	------	0	38	1	1	0	4	0	1	13
Utah:											
Salt Lake City	0	------	3	1	7	17	0	1	0	0	51
Washington:											
Seattle	0	------	1	0	8	5	0	5	0	20	95
Spokane	0	------	0	0	3	3	1	1	0	9	36
Tacoma	0	------	0	0	3	5	4	1	0	13	31
Oregon:											
Portland	2	1	0	4	5	25	0	1	1	0	85
Salem	0	3	------	0	------	2	0	------	0	0	------
California:											
Los Angeles	8	12	3	9	23	20	0	20	2	23	358
Sacramento	0	------	0	2	2	0	0	3	0	25	23
San Francisco	0	4	2	1	12	9	0	5	0	50	160

State and city	Meningococcus meningitis		Poliomyelitis cases	State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Rhode Island:				Maryland:			
Providence	2	0	0	Baltimore	0	0	1
New York:				Kentucky:			
Buffalo	2	1	0	Louisville	1	0	0
New York	4	2	0	Alabama:			
Pennsylvania:				Birmingham	4	0	0
Philadelphia	2	0	0	Louisiana:			
Ohio:				New Orleans	0	0	1
Cincinnati	2	0	0	Shreveport	0	2	0
Columbus	1	2	0	Oklahoma:			
Illinois:				Oklahoma City	0	1	0
Chicago	6	0	0	Colorado:			
Michigan:				Pueblo	2	0	0
Detroit	1	0	0	Oregon:			
Missouri:				Portland	0	0	1
Kansas City	1	0	0	California:			
Kansas:				San Francisco	1	0	0
Wichita	0	0	1				

Encephalitis, epidemic or lethargic.—Cases: New York, 3; Chicago, 1, Baltimore, 1.
Pellagra.—Cases: Charleston, S. C., 5; Atlanta, 3.
Typhus fever.—Cases: Atlanta, 1; Savannah, 2.

FOREIGN AND INSULAR

CANADA

Vital statistics- Second quarter 1937.—The Bureau of Statistics of the Dominion of Canada has published the following preliminary statistics for the second quarter of 1937. The rates are computed on an annual basis. There were 20.7 live births per 1,000 population during the second quarter of 1937 and 21.0 per 1,000 population during the second quarter of 1936. The death rate was 9.9 per 1,000 population for the second quarter of 1937 and the same rate for the second quarter of 1936. The infant mortality rate for the second quarter of 1937 was 65 per 1,000 live births and the same rate in the corresponding quarter of 1936. The maternal death rate was 5.4 per 1,000 live births for the second quarter of 1937 and 5.7 per 1,000 live births for the same quarter of 1936.

The accompanying tables give the numbers of births, deaths, and marriages by Provinces for the second quarter of 1937, and deaths from certain causes in Canada for the second quarter of 1937 and the corresponding quarter of 1936.

Number of births, deaths, and marriages, second quarter 1937

Province	Live births	Deaths (exclusive of still-births)	Deaths under 1 year of age	Maternal deaths	Marriages
Canada[1]	57,312	27,459	3,737	307	22,773
Prince Edward Island	533	308	50	1	114
Nova Scotia	3,006	1,428	180	6	907
New Brunswick	2,856	1,222	187	15	871
Quebec	20,406	8,548	1,674	122	6,963
Ontario	15,918	9,310	754	89	8,129
Manitoba	3,144	1,402	175	19	1,481
Saskatchewan	4,735	1,098	319	20	1,264
Alberta	3,897	1,509	264	23	1,375
British Columbia	2,817	1,941	131	12	1,579

---

[1] Exclusive of Yukon and the Northwest Territories.

Cause of death	Canada [1] (second quarter)		Province, second quarter 1937								
	1936	1937	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Automobile accidents	271	351		10	6	85	178	17	12	8	35
Cancer	2,891	2,952	28	167	119	711	1,109	170	171	138	279
Diarrhea and enteritis	482	470		12	15	284	76	17	37	26	12
Diphtheria	47	51		1	2	38	5	2		1	2
Diseases of the arteries	2,372	2,408	22	145	86	472	1,121	140	117	127	178
Diseases of the heart	4,165	4,152	37	198	149	1,030	1,783	221	205	201	328
Homicides	36	30		1		10	11	3		3	2
Influenza	830	968	36	64	38	311	288	38	64	95	34
Measles	108	226	1	1	4	84	8	7	60	33	28
Nephritis	1,655	1,606	23	83	54	767	501	41	67	60	100
Pneumonia	1,912	1,918	33	103	119	575	619	93	102	116	98
Poliomyelitis	7	14		1		7	2	1	1	2	
Puerperal causes	331	307	1	6	15	122	89	19	20	23	12
Scarlet fever	54	60		3		36	9	3	7	6	2
Smallpox		1									1
Suicides	256	256		8	9	48	88	22	26	25	30
Tuberculosis	1,968	1,871	11	117	112	838	349	112	75	89	168
Typhoid fever and paratyphoid fever	61	37		3	3	16	5	2	5	1	2
Whooping cough	135	174	2	12		103	24	8	14	10	1
Other violent deaths	1,068	1,128	10	58	51	302	381	49	83	75	119

[1] Exclusive of Yukon and the Northwest Territories.

CUBA

Habana—Communicable diseases—4 weeks ended November 20, 1937.—During the 4 weeks ended November 20, 1937, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	18		Tuberculosis	3	1
Malaria	[1] 104	2	Typhoid fever	[1] 21	6
Scarlet fever	1		Undulant fever		1

[1] Includes imported cases.

FINLAND

Communicable diseases—November 1937.—During the month of November 1937, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	513	Poliomyelitis	22
Dysentery	4	Scarlet fever	802
Influenza	1,858	Typhoid fever	40
Lethargic encephalitis	1	Undulant fever	1
Paratyphoid fever	50		

GERMANY

Vital statistics—Second quarter 1937.—Following are vital statistics for Germany for the second quarter of 1937:

Number of marriages	167, 912
Number of live births	329, 651
Number of live births per 1,000 population	19. 4
Number of deaths	195, 653
Deaths per 1,000 population	11. 5
Deaths under 1 year of age	21, 093
Deaths under 1 year of age per 100 live births	6. 5

IRISH FREE STATE

Vital statistics—Third quarter ended September 30, 1937.—The following vital statistics for the Irish Free State for the quarter ended September 30, 1937, are taken from the Quarterly Return of Marriages, Births, and Deaths, issued by the Registrar General, and are provisional:

	Number	Rate per 1,000 population		Number	Rate per 1,000 population
Marriages	4, 191	5. 7	Deaths from—Continued.		
Births	14, 987	20. 1	Influenza	113	.15
Total deaths	8, 615	11. 7	Measles	19	
Deaths under 1 year of age	850	[1] 57	Puerperal sepsis	5	[1].33
Deaths from:			Scarlet fever	21	
Cancer	882	1. 20	Tuberculosis (all forms)	810	1. 10
Diarrhea and enteritis (under 2 years)	203		Typhoid fever	20	
Diphtheria	40		Whooping cough	40	

[1] Per 1,000 births.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for December 31, 1937, pages 1952–1965. Similar cumulative tables will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

China—Swatow.—During the week ended December 4, 1937, 2 cases of cholera were reported in Swatow, China.

French Indochina.—During the week ended December 18, 1937, cholera was reported in French Indochina, as follows: Annam, 31 cases; Hanoi, 8 cases; Tonkin Province, 82 cases.

Plague

Ecuador—Parroquia Eloy Alfaro.—During the period November 16–30, 1937, 1 case of plague with 1 death was reported in Parroquia Eloy Alfaro, near Guayaquil, Ecuador.

Egypt—Beheira Province.—During the week ended December 18, 1937, 1 case of plague was reported in Beheira Province, Egypt.

Hawaii Territory.—Plague-infected rats have been found in Hawaii Territory, as follows: Island of Hawaii, Hamakua District, Paauilo—December 4, 2 rats; December 6, 6 rats; December 7, 5 rats; December 8, 1 rat; December 9, 1 rat; December 10–13, 3 rats. Island of Maui, Makawao District, December 7, 1 rat; December 10, 2 rats; December 16, 2 rats.

Smallpox

Mexico.—During the month of October 1937, smallpox was reported in Mexico as follows: Mexico, D. F., 5 cases, 3 deaths; Queretaro, Queretaro State, 1 case, 2 deaths; Jalapa, Vera Cruz State, 1 case.

Southern Rhodesia.—During the period November 4–10, 1937, 100 cases of smallpox were reported in Southern Rhodesia, among the natives.

Typhus Fever

Mexico.—During the month of October 1937, typhus fever was reported in Mexico as follows: Mexico, D. F., 14 cases, 9 deaths; Pachuca, Hidalgo State, 2 cases; Queretaro, Queretaro State, 2 cases; San Luis Potosi, San Luis Potosi State, 4 cases, 1 death; Toluca, Mexico State, 19 cases, 3 deaths.

Yellow Fever

Colombia—Santander Department—Velez.—During the week ended December 11, 1937, 1 death from yellow fever was reported in Velez, Santander Department, Colombia.

Dahomey—Cotonou.—On December 19, 1937, 1 suspected case of yellow fever was reported in Cotonou, Dahomey.

Gold Coast.—On December 16, 1937, yellow fever was reported in Gold Coast, as follows: 1 fatal case in Akuse and 1 fatal case in Ho.

Senegal—Louga.—On December 20, 1937, 1 case of yellow fever was reported in Louga, Senegal.

X

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JANUARY 14 - - 1938

IN THIS ISSUE

Sickness Among Industrial Employees, First Nine Months of 1937

Some New Sulphur Compounds Active Against Bacterial Infections

Recent Developments in Our Knowledge of Plague Transmission

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DIVISION OF SANITARY REPORTS AND STATISTICS

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The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PUBLIC HEALTH REPORTS

VOL. 53 JANUARY 14, 1938 NO. 2

SICKNESS AMONG MALE INDUSTRIAL EMPLOYEES DURING THE THIRD QUARTER AND THE FIRST 9 MONTHS OF 1937[1]

The data on the frequency of sickness and nonindustrial accidents lasting 8 consecutive calendar days or longer during the third quarter and the first 9 months of 1936 and 1937, presented in the accompanying tables, are derived from analyses of reports from 26 industrial sick-benefit organizations. The reports for the first 9 months of 1937 are based on an average of 183,748 male employees, 52 percent being employed in the iron and steel industry, 17 percent in public utilities, and 31 percent in industries producing chemicals, abrasives, plumbing fixtures, electrical equipment, paper, paper novelties, timepieces, hats, soap, and certain other products. The reporting establishments are located east of the Mississippi River and north of the Ohio and Potomac Rivers.

Considering the data for the first 9 months of 1937, as shown in table 1, the frequency of cases of sickness and nonindustrial accidents causing disability for 8 consecutive calendar days or longer was 104.4 per 1,000 men, as compared with 92.3 for the corresponding period of 1936, and 88.3 for the corresponding periods of the 5 years 1932–36. The influenza epidemic which occurred in the first quarter of the year was chiefly responsible for the excessive rate in 1937. The epidemic was reflected in the incidence of respiratory diseases during the first 9 months of 1937, the rate, 44.0, being 34 percent greater than the corresponding rate (32.8) for the previous year. More specifically, influenza and grippe showed a rate for the first 9 months of 1937 of 24.4, which was 65 percent greater than the corresponding rate (14.8) for 1936. Diseases of the pharynx and tonsils (5.6 cases per 1,000 men) was 14 percent in excess of the rate for 1936 (4.9), and 19 percent in excess of the rate for the period 1932–1936 (4.7). Diseases of the rheumatic group (particularly diseases of the organs of locomotion) showed a decrease of 8 percent, while infectious and parasitic diseases showed an increase of 23 percent; the former group was 7 percent below its 5-year average and the latter was 23 percent above its 5-year average.

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[1] From the Division of Industrial Hygiene of the National Institute of Health, U. S. Public Health Service, Washington, D. C. The report for the second quarter and the first half of 1937 was published in the Public Health Reports for October 29, 1937 (52: 1523–1526).

TABLE 1.—*Frequency of disability lasting 8 calendar days or longer in the third quarter of 1937 compared with the same quarter of 1936, and in the first 9 months of 1937 as compared with the corresponding period of preceding years. (Male morbidity experience of industrial companies which reported their cases to the U. S. Public Health Service)* [1]

Diseases and disease groups which caused disability. (Numbers in parentheses are disease title numbers from the International List of the Causes of Death, fourth revision, Paris, 1929)	Annual number of disabilities per 1,000 men in—				
	Third quarter of—		First 9 months of—		
	1937	1936	1937	1936	5 years 1932–36
Sickness and nonindustrial injuries [2]	79.4	76.8	104.4	92.3	88.3
Nonindustrial injuries	13.3	13.6	11.6	11.8	11.6
Sickness [2]	66.1	63.2	92.8	80.5	76.7
Respiratory diseases	19.4	17.0	44.0	32.8	30.4
Bronchitis, acute and chronic (106)	2.9	2.7	4.7	4.8	3.7
Diseases of the pharynx and tonsils (115a)	4.5	4.2	5.6	4.9	4.7
Influenza and grippe (11)	5.3	4.4	21.4	11.8	14.7
Pneumonia, all forms (107–109)	1.5	.9	2.9	2.8	2.1
Tuberculosis of the respiratory system (23)	.9	.8	.8	.8	.9
Other respiratory diseases (104, 105, 110–114)	4.3	4.0	5.6	4.7	4.3
Nonrespiratory diseases	46.7	46.2	48.8	47.7	46.3
Diseases of the stomach, cancer excepted (117, 118)	4.0	3.7	3.9	3.8	3.7
Diarrhea and enteritis (120)	2.2	1.8	1.5	1.4	1.2
Appendicitis (121)	4.5	4.7	4.6	4.4	3.9
Hernia (122a)	1.4	1.8	1.6	1.8	1.6
Other digestive diseases (115b, 116, 122b–129)	2.3	2.8	2.1	2.9	3.0
Rheumatic group, total	8.5	9.5	9.3	10.1	10.0
Rheumatism, acute and chronic (56, 57)	3.8	4.0	4.3	4.5	4.8
Diseases of the organs of locomotion (156b)	2.7	3.2	2.8	3.3	3.0
Neuralgia, neuritis, sciatica (87a)	2.0	2.3	2.2	2.3	2.2
Neurasthenia and the like (part of 87b)	1.2	1.0	1.1	1.1	1.1
Other diseases of the nervous system (78–85, part of 87b)	.9	1.1	1.0	1.2	1.3
Diseases of the heart and arteries, and nephritis (90–99, 102, 130–132)	3.8	3.3	4.0	3.8	3.9
Other genito-urinary diseases (133–138)	2.1	2.2	2.3	2.3	2.4
Diseases of the skin (151–153)	3.4	3.8	3.2	2.9	2.8
Infectious and parasitic diseases, except influenza (1–10, 12–22, 24–33, 36–44)	1.9	1.4	3.2	2.6	2.6
Ill-defined and unknown causes (200)	3.9	3.1	3.7	2.8	2.2
All other diseases (45–55, 58–77, 88, 89, 100, 101, 103, 154–156a, 157, 162)	7.1	6.0	7.0	6.6	6.6
Average number of males covered in the record	188,327	162,721	183,718	153,780	145,070
Number of companies	26	26	26	26	

---

[1] In 1937 and 1936 the same companies are included; the rates for the first 9 months of the years 1932 to 1936 include 21 of these companies, which employed an average of approximately 80 percent of the 145,070 men representing the sample average annual population for the 5-year period.

[2] Exclusive of disability from the venereal diseases and a few numerically unimportant causes of disability.

For the third quarter of 1937, the rate (79.4 cases per 1,000) for all sickness and nonindustrial accidents was 3 percent higher than for the same quarter of 1936 (76.8). With respect to particular diseases and disease groups, interest in the third quarter centers around influenza and grippe, pneumonia, infectious and parasitic diseases, and the rheumatic group, the first three showing percentage increases of 20, 67, and 36, respectively, and the last (particularly diseases of the organs of locomotion) a decrease of 11 percent.

The rate for pneumonia for the third quarter of 1937 was 1.5 cases per 1,000 men as compared with 0.9 for the same quarter of 1936, while the rates for the first 9 months of 1937 and 1936, 2.9 and 2.8

cases per 1,000, respectively, exceeded the rate (2.1) for the same period of the 5 years under consideration. The increases probably reflect the relatively large increase in the membership in the iron and steel industry, an industry whose workers are well known for their relatively high pneumonia rate. With respect to membership in the sick-benefit associations, table 2 shows for each of 3 quarters the percentage increase from 1936 to 1937 among the iron and steel workers, and among workers in all other industries; in the iron and steel industry there was an increase of 29.2 percent, while all other industries showed an increase of 10.4 percent. The pneumonia case rate among the iron and steel workers during the first 9 months of 1937 was 3.5 cases per 1,000, as compared with 2.2 for employees in other industries; this difference represents an excess of 59 percent in the instance of the iron and steel workers. Among other industrial workers the rate for the first 9 months of 1937 (2.2) was 8 percent less than for the same period of 1936 (2.4). The iron and steel workers experienced an increase of 13 percent in the first 9 months of 1937 (3.5) as compared with the same period of 1936 (3.1). Thus, the pneumonia rate among the iron and steel workers for the first 9 months of 1936 and 1937 is not only higher than the corresponding rate for the other workers, but the 9-month rate among the iron and steel workers is higher for 1937 than for the corresponding period of 1936

TABLE 2.—*Average number of males covered in the records and the frequency of cases of pneumonia among all employees except those in the iron and steel industry and among iron and steel workers only, for the first 3 quarters of 1937, compared with similar periods of 1936*

Quarter	All except iron and steel employees		Iron and steel employees only		All except iron and steel employees	Iron and steel employees only
	1937	1936	1937	1936	Percentage changes 1936 to 1937	
	Average number of males covered					
First	86,036	77,379	89,512	68,322	+11.2	+31.0
Second	88,555	79,225	98,814	73,692	+11.8	+34.1
Third	88,240	81,525	100,087	81,196	+8.2	+23.3
First 9 months	87,610	79,376	96,138	74,403	+10.4	+29.2
	Annual number of cases of pneumonia per 1,000 men					
First	3.5	4.3	5.4	5.6	−18.6	−3.6
Second	1.9	2.2	3.4	3.2	−13.6	+6.2
Third	1.1	.9	1.9	1.0	+22.2	+90.0
First 9 months	2.2	2.4	3.5	3.1	−8.3	+12.9

STUDIES IN CHEMOTHERAPY

VII. SOME NEW SULPHUR COMPOUNDS ACTIVE AGAINST BACTERIAL INFECTIONS

By HUGO BAUER, *Research Associate*, and SANFORD M. ROSENTHAL, *Senior Pharmacologist, Division of Pharmacology, National Institute of Health, United States Public Health Service*

As a result of the original discovery of Prontosil by Domagk, and the subsequent development of sulfanilamide by Trefouel, Nitti, and Bovet, active investigation has been under way to obtain more effective compounds. The studies of Buttle, Gray, and Stephenson (*1*) and of Fourneau, Trefouel, Nitti, and Bovet (*2*) have been important contributions to the study of the relation of chemical structure to therapeutic action. Goissedet, Despois, Gaillot, and Mayer (*3*) developed the benzyl-aminobenzene sulfonamide ("Setazine") which is of slightly lower activity than sulfanilamide (*4*) but of very low toxicity (*5*). p-aminobenzene sulfonyl-sulfanilamide (di-sulfanilamide) was independently described by Gray, Buttle, and Stephenson (*6*), by ourselves (*4*), and in the German patent literature by Domagk (*7*). We found this compound approximately twice as active (by weight) as sulfanilamide when injected in oil subcutaneously, and also of very low toxicity. We obtained less favorable therapeutic results by mouth, although Domagk and the English investigators report it somewhat better than sulfanilamide administered orally. Domagk has recently reported on the use of di-sulfanilamide and its methyl and di-methyl derivatives in experimental staphylococcus infections (*7*).

HUMAN TOXICITY OF DI-SULFANILAMIDE [1]

Domagk refers to a report of O. Grutz (München. Med. Wchnschr. *84:* 1201 (1937)), who has employed di-sulfanilamide under the designation of D. B. 32, the methyl derivative (D. B. 87) and the di-methyl derivative (D. B. 90) in 36 cases of gonorrhea. Grutz employed 2 to 3 grams a day for 7 to 14 days. A high incidence of fever and dermatitis occurred as a result of therapy.

Some preliminary observations made upon 10 cases of gonorrhea indicate that, in human beings, toxic manifestations (fever, cyanosis, dermatitis) are as frequent from di-sulfanilamide as they are from sulfanilamide, if not more frequent. Furthermore, 4 cases of peripheral neuritis developed among these 10 individuals to whom di-sulfanilamide was administered. The dosage in each instance was 4.0 grams daily for 10 days.

---

[1] These studies were undertaken at this time because the drug was being distributed for clinical use from sources over which we had no control.

These observations are reported at this time to serve as an illustration of the care that must be taken in the introduction of a new drug. The acute toxicity of di-sulfanilamide to animals (*4*) is very low,[2] and in chronic toxicity studies 0.5 gram per kilo daily to rats for 30 days produced no demonstrable toxic effects. Effects upon human beings are not always predictable from animal experiments and the clinical use of a new drug should be preceded not only by a thorough pharmacological and toxicological study of the drug upon several species of animals, but also a careful study of its effects upon human beings under conditions where they can be closely observed for a considerable period of time.

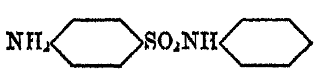
OTHER SULPHUR COMPOUNDS

An important development in the field of bacterial chemotherapy has been made by Buttle, Stephenson, Smith, and Foster (*8*), and by Fourneau, Trefouel, Nitti, and Bovet (*9*), who simultaneously reported upon the chemotherapeutic activity of diamino diphenylsulfone, dinitro diphenylsulfone, and the corresponding sulfides. These compounds were originally described by Fromm and Wittmann in 1908 (*10*), but their therapeutic action had not previously been explored. It has thus been demonstrated that neither the sulfonamide group nor the amino group is essential to therapeutic action. An entirely new series of chemical compounds is therefore subject to approach in the field of bacterial chemotherapy.

The present report deals with some new derivatives of the above compounds which we have prepared and studied.

SULFANILAMIDE DERIVATIVES

Buttle (*1*) first studied the anilide of sulfanilamide:



(X)

He reported it as active as sulfanilamide, although in our experience it has been about one-half as active (weight for weight). We have obtained three new compounds in this series by substitution in the para position (X) with COOH, NO_2, and NH_2.

The carboxy derivative, p-aminobenzene sulfonyl p-aminobenzoic acid, was of low toxicity but possessed little chemotherapeutic action against streptococci. The sodium salt was freely soluble in water.

The nitro derivative, sulfanil-p-nitroanilide, was two to three times as active as sulfanilamide by mouth or upon subcutaneous injection, in oil. However, it was approximately twice as toxic.

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[2] A recent report by O. W. Barlow (Proc. Soc Exp. Biol. and Med., 37: 315 (1937)) states that mice tolerate up to 40 grams per kilo without nervous symptoms. We have, however, been able to produce characteristic symptoms of paralysis, and in some cases death, in rabbits with 1 gram per kilo of di-sulfanilamide administered orally for from 5 to 8 days.

The amino derivative, sulfanil p-aminoanilide, was approximately two times as active as sulfanilamide against streptococci, and of about the same order of toxicity as sulfanilamide.

These three compounds were inferior to sulfanilamide against pneumococci.

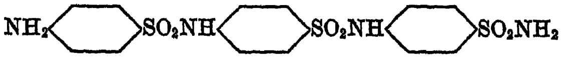
Two other (water soluble) derivatives of sulfanilamide, p-aminobenzene sulfonyl ethanolamine $NH_2C_6H_4SO_2NH \cdot C_2H_4OH$ and p-aminobenzene sulfonyl glycine $NH_2C_6H_4SO_2NH \cdot CH_2COOH$ were found to be of inferior activity.

DERIVATIVES OF DI-SULFANILAMIDE

The mono-sodium salt of di-sulfanilamide in water, injected subcutaneously, was found to be of increased toxicity and of lowered therapeutic activity.

The water soluble ethanolamine derivative $NH_2C_6H_4SO_2NH \cdot C_6H_4SO_2NH \cdot C_2H_4OH$ and glycine derivative $NH_2C_6H_4SO_2NH \cdot C_6H_4SO_2NH \cdot CH_2COOH$ were of low toxicity; the former was slightly less active than sulfanilamide, while the latter was decidedly inferior, against streptococci and pneumococci.

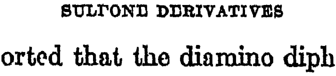
Following the procedure for obtaining di-sulfanilamide it is possible to obtain higher members of this series. By condensing sulfanilamide with p-acetyl aminobenzene sulfonyl p-aminobenzene sulfonyl chloride and subsequently deacetylating, the tri-sulfanilamide was prepared:



This compound, as well as its mono-sodium salt, was found to be of inferior action against streptococci and pneumococci.

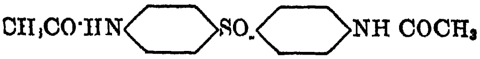
SULFONE DERIVATIVES

Buttle (*8*) has reported that the diamino diphenylsulfone,



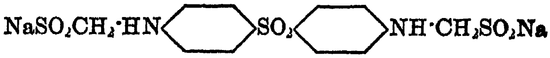
is approximately 100 times as active against streptococcal infections in mice as sulfanilamide, and 25 times as toxic. In our experiments, employing two virulent strains of streptococci (different from those used by Buttle), the diaminosulfone proved to be approximately 30 times as active (by weight) as sulfanilamide. Results with the toxicity of this compound given orally to mice have been in general agreement with those of Buttle. We have found the maximum tolerated dose for therapeutic purposes to be 0.1 gm per kilo (2 mg per 20 gm). The repeated administration of this dosage at daily intervals to infected mice often provokes symptoms of marked excitability.

It is therefore desirable to obtain derivatives of this highly active compound in which the toxicity will be lowered without corresponding decrease in therapeutic action. Fourneau, Trefouel, Nitti, and Bovet (*9*) have reported upon the diacetyl derivative:



They have found this compound tolerated in doses up to 10 grams per kilo when given orally to mice, while its activity against streptococci and pneumococci was 10 times as great as that of sulfanilamide.

We have prepared the formaldehyde sulfoxylate derivative of the diaminosulfone:



This compound is of interest in that it is a highly active preparation which is freely soluble in water and can be injected subcutaneously without apparent signs of irritation.

We have also prepared the corresponding formaldehyde bisulfite derivative of diamino diphenylsulfone and found it to possess surprisingly little chemotherapeutic activity.

Comparative studies have been carried out on mice on the toxicity and therapeutic activity of the diamino diphenylsulfone and its diacetyl and diformaldehyde sulfoxylate derivatives. Two virulent strains of streptococci, and three strains of pneumococci, types I, II, and III, were employed.

Toxicity studies upon normal mice revealed that the diaminosulfone caused death in 2 of 3 mice from 0.25 gm per kilo given orally. With a dosage of 0.2 gm per kilo symptoms of excitability occurred, with 10 percent mortality; 0.15 gm per kilo caused some excitability and spasticity but no fatalities.

With the formaldehyde sulfoxylate derivative, 3 gm per kilo subcutaneously was tolerated without appreciable symptoms; 4.0 gm per kilo caused 44 percent mortality; while 6 gm caused 66 percent mortality. The only symptom prior to death was respiratory distress. A comparison of the acute toxicities of these two compounds is shown in the following table:

Drug	Dosage, gm per kilo	Number of mice	Mortality
			Percent
Diamino diphenylsulfone	0.15	5	0
	.20	10	10
	.25	3	75
	.50	3	100
Formaldehyde sulfoxylate sulfone	2.0	7	0
	3.0	7	0
	4.0	9	44.4
	6.0	3	66.6

The sulfoxylate derivative is very sensitive to weak acids, and we have found it more toxic when administered orally, probably as a result of decomposition in the acid gastric contents.

Four grams per kilo of the acetyl derivative given orally were tolerated without symptoms. We have had insufficient material to test the toxicity further.

Comparative studies were made in mice infected with streptococcus No. 1685, an erysipelas strain, and strain No. 995, isolated from human septicemia (Lancefield group A strains). The number of organisms injected intraperitoneally (0.5 cc 10^{-6} dilution of broth culture) represented approximately 100 lethal doses. The results are shown in table 1 and in figures 1 and 2. It is seen that the following doses represent approximately equal activity:

	Gm per kilo
Diaminodiphenyl sulfone	0. 025
Diacetyl diamino diphenylsulfone	. 2
Diformaldehyde sulfoxylate diamino diphenylsulfone	. 2
Sulfanilamide	. 75

TABLE 1.—*Streptococcus 1685*

Drug	Therapy	Deaths in days										Mortality
		1	2	3	4	5	6	7	8	9	10	
												Percent
Sulfanilamide	1 gm per kilo, orally, 4 days	---	---	---	---	---	---	3	---	---	---	26.6
	0.5 gm per kilo, orally, 4 days	---	8	---	---	---	2	--	---	---	1	73.3
Di-sulfanilamide	1 gm per kilo, orally, 4 days	1	6	1	---	---	3	---	---	---	1	80
	0.5 gm per kilo, orally, 4 days	---	5	1	---	1	3	3	1	---	1	100
Diamino diphenylsulfone.	0.05 gm per kilo, orally, 4 days	[1] 1	1	---	---	---	1	1	---	---	1	28.5
	0.025 gm per kilo, orally, 4 days	---	5	1	---	---	---	2	1	---	---	60
Diacetyl diamino diphenylsulfone.	0.5 gm per kilo, orally, 4 days	2	2	1	---	3	---	---	1	---	--	60
	0.2 gm per kilo, orally, 4 days	1	4	---	---	2	---	--	---	---	2	60
Diformaldehyde sulfox. sulfone.	0.5 gm per kilo, s. c., 4 days	---	1	---	1	---	---	2	1	1	---	40
	0.2 gm per kilo, s. c., 4 days	---	3	2	---	---	1	2	1	---	---	60
Controls	None	15	---	---	---	---	---	---	--	-	- -	100
	Streptococcus 995											
Sulfanilamide	1 gm per kilo, orally, 2 days	---	---	1	--	1	2	1	---	---	---	33.3
	0.5 gm per kilo, orally, 2 days	---	---	---	2	4	2	1	---	1	---	66.6
Di-sulfanilamide	1 gm per kilo, orally, 2 days	---	---	---	2	2	3	1	2	---	---	66.6
	0.5 gm per kilo, orally, 2 days	---	---	1	6	3	3	---	--	--	---	86.6
Diamino diphenyl-sulfone.	0.05 gm per kilo, orally, 2 days	---	---	---	---	---	1	1	3	3	---	53.3
	0.025 gm per kilo, orally, 2 days	---	---	1	---	1	3	2	--	---	---	46.6
Diacetyl sulfone	0.5 gm per kilo, orally, 2 days	---	---	---	1	---	2	1	1	---	---	33.3
	0.25 gm per kilo, orally, 2 days	---	---	---	---	2	3	---	1	---	1	46.6
Diformaldehyde sulfox. sulfone.	0.5 gm per kilo, s. c., 2 days	---	---	---	1	1	1	1	1	2	1	53.3
	0.25 gm per kilo, s. c., 2 days	[1] 1	---	---	---	---	5	2	---	---	---	50.0
Controls	None	10	3	2	---	---	---	---	---	---	---	100.0

[1] Death not due to streptococcal infection.

Comparative action of compounds against 2 strains of streptococci. 0.5 cc of 10^{-6} broth culture of organisms intraperitoneally. Therapy within ½ hour and repeated daily as indicated. 15 mice in each group.

Di-sulfanilamide was approximately one-half as active as sulfanilamide when given orally. It must be remembered that this relationship is reversed when these two drugs are injected subcutaneously in oil (*4*).

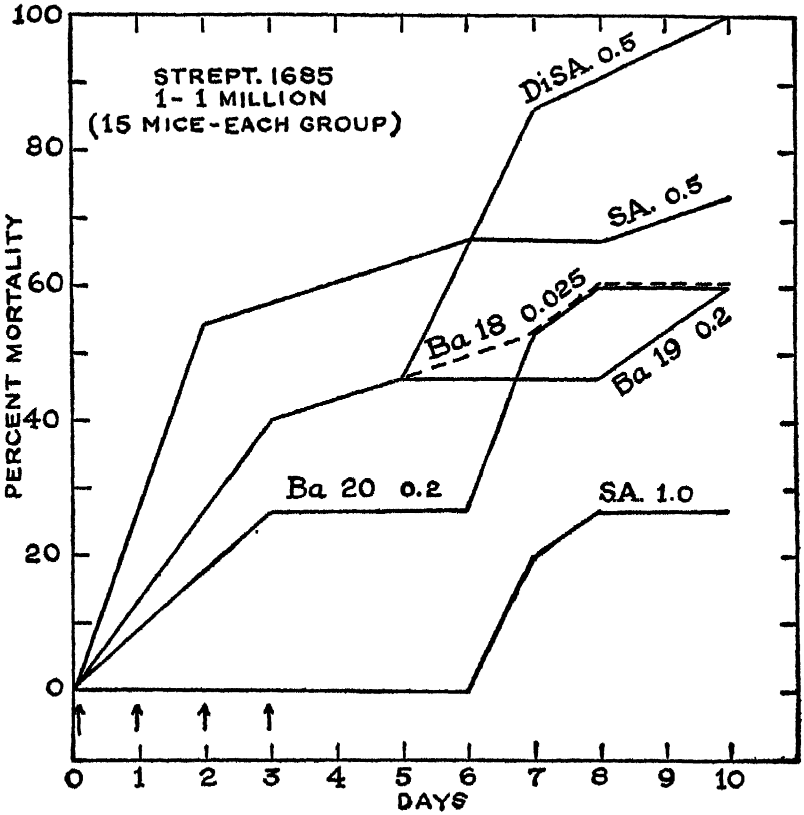


FIGURE 1.—Comparative action of compounds against streptococcus No. 1685 infection in mice. Dosage in grams per kilo is shown on curves and time of administration is indicated by arrows. S. A.=sulfanilamide. DiS.A. di-sulfanilamide. Ba 18 diamino diphenylsulfone. Ba 19=diacetyl diamino diphenylsulfone. Ba 20 diformaldehyde sulfoxylate diamino diphenylsulfone (see table 1).

From the above observations the following tentative comparison can be made, employing the therapeutic index as representing

$$\frac{\text{Maximum tolerated dose}}{\text{Minimum effective dose}}.$$

It must be emphasized that these comparisons should be established on several species of animals before they can be accepted as a probable index of the behavior in human beings. It must also be pointed out that the animal toxicity of sulfanilamide and related compounds has not revealed certain manifestations, such as fever, dermatitis, cyanosis, and hematological changes, which have been encountered in human beings.

			Therapeutic index
Sulfanilamide (oral administration)	MTD	2. 5	3. 3
	MED	0. 75	
Di-sulfanilamide (oral administration)	MTD	8. 0	5. 0
	MED	1. 6	
Diamino diphenylsulfone (oral administration)	MTD	0. 15	6. 0
	MED	0. 025	
Formaldehyde sulfoxylate sulfone (subcutaneous administration	MTD	3. 0	15. 0
	MED	0. 2	
Diacetylsulfone (oral administration)	MTD	>4	>20
	MED	0. 2	

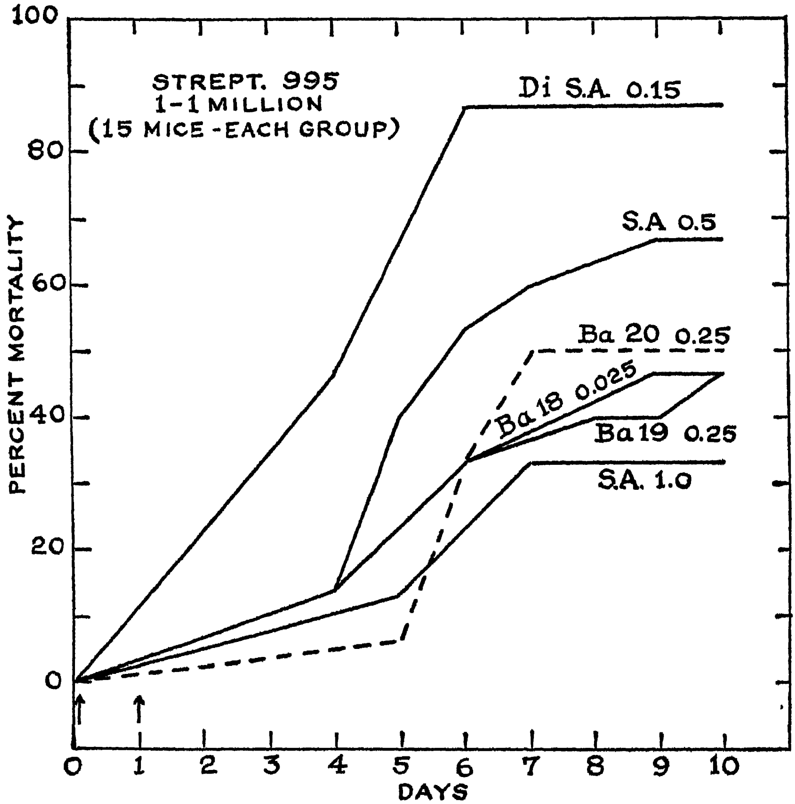


FIGURE 2.—Comparison of compounds against streptococcus No. 995. (For interpretation see figure 1 and table 1.)

EXPERIMENTS ON PNEUMOCOCCI

A number of tests have been made on pneumococci for the purpose of comparing these compounds. Some results are shown in table 2.

Buttle has reported in preliminary experiments (*8*) that the diamino sulfone is superior to sulfanilamide in pneumococcal infections, while

Fourneau (*9*) finds the diacetyl derivatives 10 times as effective as sulfanilamide.

Our experiences indicate that the diamino sulfone as well as its diacetyl and sulfoxylate derivatives are all superior to sulfanilamide. However, we have encountered variations in effectiveness between the three organisms (types I, II, and III) that make comparison difficult. Upon the Type I organism the diamino sulfone was most effective, while the diacetyl derivative was least active. Upon types II and III organisms no appreciable differences were observed among the three compounds. It is believed that these variations represent strain rather than type differences.

TABLE 2.—*Pneumococcus, Mulford Type I, 10^{-6}*

Drug	Therapy	Number of mice	Deaths in days										Mortality
			1	2	3	4	5	6	7	8	9	10	
													Per-cent
Diamino diphenylsulfone.	0.1 gm per kilo, orally, 5 days	10	---	---	---	3	1	---	1	---	---	---	50
Diacetylsulfone	1.0 gm per kilo, orally, 4 days	10	---	2	5	3	---	---	---	---	---	---	100
Diformaldehyde sulfox. sulfone.	1 gm per kilo, s. c., 5 days	10	---	--	1	5	---	1	1	1	---	1	100
Sulfanilamide	1 gm per kilo, orally, 4 days	10	---	1	6	---	2	1	---	---	---	---	100
Controls	None	10	6	4	---	---	---	---	---	---	---	---	100
	Pneumococcus Mulford II 10^{-6}												
Diamino diphenylsulfone.	0.1 gm per kilo, orally, 4 days	10	---	---	1	1	1	2	3	---	1	1	100
Diacetylsulfone	1.0 gm per kilo, orally, 4 days	10	---	---	1	---	---	---	2	2	---	2	70
Diformaldehyde sulfox. sulfone.	1.0 gm per kilo, s. c., 4 days	10	---	2	---	---	---	1	1	2	2	2	100
Sulfanilamide	1.0 gm per kilo, orally, 4 days	10	---	---	2	---	1	3	---	3	---	1	100
Controls, 10^{-6}	None	10	7	8	---	---	---	---	---	---	---	---	100
10^{-7}	None	2	2	---	---	---	---	---	---	---	---	---	100
10^{-8}	None	2	1	1	---	---	---	---	---	---	---	---	100
	Pneumococcus, Mulford III, 10^{-6}												
Diamino diphenylsulfone.	0.01 gm per kilo, orally, 4 days	10	1	---	---	1	7	---	---	---	---	---	90
Diacetylsulfone	1.0 gm per kilo, orally, 4 days	10	---	1	1	2	4	1	---	---	---	---	90
Diformaldehyde sulfox. sulfone.	1 gm per kilo, s. c., 4 days	10	---	---	2	8	4	1	---	--	---	---	100
Sulfanilamide	1 gm per kilo, orally, 4 days	10	---	2	7	1	---	---	---	---	---	---	100
Controls, 10^{-6}	None	10	8	2	---	---	---	---	---	---	---	---	100
10^{-7}	None	2	2	---	---	---	---	---	---	--	---	---	100
10^{-8}	None	2	---	2	---	---	---	---	---	---	---	---	100

Comparative action of compounds against pneumococci. 0.5 cc of broth culture (10^{-6} dilution) intraperitoneally. Therapy within ½ hour, and repeated daily as indicated.

Our results with the sulfones show that, although marked prolongation of life is brought about in pneumococcal infections, few animals permanently survive as a result of therapy. Similar results with sulfones have been reported by Domagk (*7*). Those sulfone derivatives of low toxicity and more marked action are of greater promise than sulfanilamide against pneumococci, but at their present degree of effectiveness it would seem preferable to consider their use chiefly in conjunction with serum therapy, where a synergism has been shown to exist (*11*, *12*).

DINITRO SULFONES

As previously mentioned, Buttle and coworkers found the dinitrodiphenyl sulfone to be as active as sulfanilamide, while Fourneau described a preparation (M. P. 238° C.) 10 times as active; Fourneau makes mention of the existence of different isomers of this compound.

The original compound described by Fromm and Wittmann (*10*) melted at 282° C. Following the method of Fromm and Wittmann, a compound of the same melting point was obtained, and in addition some other fractions whose melting points were as follows: 250°, 252°, 305°, and 325° C. All of these preparations possessed only feeble activity against streptococci and pneumococci. The inactivity of our preparations may signify that they are different isomers from those investigated by Buttle and by Fourneau. Further work is required to clarify this phase of the problem.

SUMMARY

Some new derivatives of sulfanilamide and di-sulfanilamide have been prepared and tested against streptococci and pneumococci. Only one compound in this group proved to be slightly superior to sulfanilamide, the sulfanil p-amino-anilide. It has been confirmed that much more favorable results are obtained with di-sulfanilamide when it is injected in oil than when given orally. By mouth di-sulfanilamide has a therapeutic index only twice as good as sulfanilamide.

Comparative studies of toxicity and chemotherapeutic action have been carried out in mice on the diamino diphenylsulfone, first studied by Buttle and coworkers, the acetyl derivative of this compound introduced by Fourneau and coworkers, and the formaldehyde sulfoxylate derivative first prepared by us.

The diamino diphenylsulfone was found to be approximately 30 times as active against streptococci as sulfanilamide, but its high toxicity makes its therapeutic index only two times as favorable.

The formaldehyde sulfoxylate derivative on subcutaneous injection has a therapeutic index approximately five times as good as sulfanilamide orally. This compound is of interest in that it is the first water soluble preparation that we have obtained with high therapeutic activity.

The acetyl derivative possesses a therapeutic index more than six times as high as sulfanilamide against streptococcal infections in mice.

Against pneumococcal infections in mice these three sulfones are all superior to sulfanilamide. However, in mice the action is still considerably less marked than against streptococci; and, while marked prolongation of life can be achieved, few animals permanently survive pneumococcal infections as a result of therapy.

REFERENCES

(*1*) Buttle, G. A., Gray, W. H., and Stephenson, D.: Protection of mice against streptococcal and other infections by p-aminobenzene sulfonamide and related substances. Lancet, I: 1286 (1936).

(*2*) Fourneau, E., Trefouel, J., Nitti, F. and Bovet, D.: Chemotherapie des infections streptococciques par les dérivés du p-aminophenylsulfamide. Compt. rend. Soc. de biol., **122:** 258, 652 (1936).

(*3*) Goissedet, P., Despois, R., Gaillot, P. and Mayer, R.: De l'action du radical sulfamide sur l'infection streptococcique experimentale de la souris. Compt. rend. Soc. de biol., **121:** 1082 (1936).

(*4*) Rosenthal, S. M., Bauer, H., and Branham, S. E.: Studies in chemotherapy. IV. Comparative studies of sulfonamide compounds in experimental pneumococcus, streptococcus, and meningococcus infections. Pub. Health Rep., **52:** 662 (1937).

(*5*) Halpern, B. N., and Mayer, R. L.: Toxicité expérimentale comparée de quelques substances antistreptococciques. Presse méd., **45:** 747 (1937).

(*6*) Gray, W. H., Buttle, G. A., and Stephenson, D.: Derivatives of p-aminobenzenesulfonamide in the treatment of streptococcal infection in mice. Biochem. J., **31:** 724 (1937).

(*7*) Domagk, G.: Weitere Untersuchungen uber die chemotherapeutische Wirkung Sulfonamidhaltiger Verbindungen bei bakteriellen Infektionen. Klin. Wchnschr., **41:** 1412 (1937).

(*8*) Buttle, G. A., Stephenson, D., Smith, S., and Foster, G. E.: Treatment of streptococcal infections in mice with 4:4′ diamino-diphenylsulfone. Lancet, I: 1331 (1937).

(9) Fourneau, E., Trefouel, J., Nitti, F., and Bovet, D.: Action antistreptococcique des dérivés sulfures organiques. Compt. rend. Acad. d. sc., **204:** 1763; **205:** 299 (1937).

(*10*) Fromm, E., and Wittmann, J.: Derivate des p-nitrothiophenols. Berichte der Deutsch. Chem. Gesellsch., **41:** 2261 (1908).

(*11*) Gross, P., and Cooper, F. B.: p-aminobenzenesulfonamide and antipneumococcal serum therapy in Type I pneumococcal infections of rats. Proc. Soc. Exper. Biol. & Med., **36:** 535 (1937).

(*12*) Branham, S. E., and Rosenthal, S. M.: Studies in chemotherapy. V. Sulfanilamide, serum, and combined drug and serum therapy in experimental meningococcus and pneumococcus infections in mice. Pub. Health Rep., **52:** 685 (1937).

RECENT DEVELOPMENTS IN OUR KNOWLEDGE OF PLAGUE TRANSMISSION *

By C. R. Eskey, *Senior Surgeon, United States Public Health Service, in charge of plague suppressive measures, San Francisco, Calif.*

Over 30 years have elapsed since the Indian Plague Commission demonstrated that fleas acted as the transmitting agents of bubonic plague. Since then, many investigators have attempted to implicate other blood-sucking parasites, such as bed bugs, lice, and ticks, as vectors of this disease. Thus far there is no evidence to indicate that any insect except the flea is of any importance in the natural dissemination of plague. Most of the work of the Indian Plague Commission was conducted with fleas of the genus *Xenopsylla*. The Commission also investigated the ability of other species to transmit plague, some of which failed entirely to act as vectors, such as the oriental cat fleas. Regardless of these negative findings there has developed a widespread belief that the bites of practically all fleas that have fed on plague-infected animals are very likely to transmit the disease. Some workers claim that plague transmission by fleas is purely a mechanical process, and so they believe that practically all species of fleas are about equally involved as vectors. However, if one compares the epizootics and epidemics of plague that have occurred throughout the world during the present pandemic, it will be noted that the persistence and the severity of infection have varied greatly according to climatic conditions, which, in turn, have a great influence in determining the prevalence of different species of fleas found on domestic rats, but little effect on the human susceptibility to plague or the extent of the rat population of cities.

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* Read before the health officers section, League of California Municipalities, San Jose, Calif., Sept. 15, 1937.

That the intensity of plague epidemics is not regulated by the total number of fleas present on rats of a community but rather by the species of fleas with which the rats are infested is well illustrated by the course of the outbreaks in San Francisco, Calif., and Guayaquil, Ecuador. Flea surveys at these two places show that the rats of San Francisco average over 7 fleas per animal, or about 2 more than found on rats at Guayaquil, yet there were only 278 cases of plague reported in the former city in the course of 7 years while there was an average of 364 cases per annum at Guayaquil during the 22 years that the infection was continuously present. Only one species of rodent flea *Xenopsylla cheopis* was found on rats of the South American city while three species, *Nosopsyllus fasciatus*, *Xenopsylla cheopis*, and *Ctenopsyllus segnis*, were present on the San Francisco rats. The *cheopis* index of the latter city was only about half that of Guayaquil, which probably accounts for the mild type of the epidemic at San Francisco. If *fasciatus*, the most prevalent of the three flea species in San Francisco were as efficient a vector of plague as *cheopis*, the California outbreak would have been much more severe. In this connection it may be stated that, insofar as is known, plague epidemics have never occurred in communities where *fasciatus* existed alone and were not associated with *cheopis*.

During the past year an experimental investigation was begun at the Public Health Service laboratory in San Francisco to determine as nearly as possible the infectibility of fleas found on rats and wild rodents when fed on plague-infected guinea pigs and also their ability to transmit the disease to other guinea pigs during the act of feeding. Some interesting observations regarding plague-infected fleas have already been made, but this type of experiment requires a large amount of data before positive conclusions can be formulated; therefore such statements as are made in this paper are only impressions gained from the study thus far, and some of them may have to be modified later. Only eight species of fleas have been used in the experiments, three from rats, and five from wild rodents. It is hoped that other fleas will be available for investigation during the coming winter months.

By housing each flea in a separate test tube it has been possible to keep a complete individual history chart. In attempting to infect a flea with plague, only one feeding on an infected animal was allowed in most of the experiments. Fleas were fed on the sick guinea pigs just a few hours before the latter were expected to die, as plague septicemia seldom occurs as early as 48 hours before death of a guinea pig. Of 270 fleas fed on guinea pigs at a time when the blood was capable of infecting fleas, 66 were later proved to harbor virulent organisms. Three methods are available for determining whether or not fleas are plague infected: First, by the transmission of the disease by feeding on experimental animals; second, by inoculating experimental animals with the dead fleas; and third, by inoculation with flea feces. The latter procedure is the most important in detecting plague-infected fleas when they are alive.

As might be expected, *Xenopsylla cheopis* were found to be much more susceptible to plague infection than any of the other fleas tested, as 32, or 66 percent, of those fed on infected guinea pigs were later found to harbor the plague bacillus, while only 21 percent of all the other fleas were so infected. In one group of 19 *cheopis*, 79 percent were infected by one feeding on septicemic blood. Four species, *Nosopsyllus fasciatus* from rats, *Diamanus montanus* and *Hoplopsyllus anomalus* from California ground squirrels, and fleas from desert antelope ground squirrels all showed approximately the same degree of susceptibility to plague infection, as about 25 percent of them harbored virulent organisms. An even smaller number, only 10 percent, of mouse fleas, *Ctenopsyllus segnis*, and fleas from *Peromyscus* (white-footed mice) were infected, while it was impossible to demonstrate any infection among 24 *Oropsylla idahoensis* used in the experiments. The latter fleas were obtained from *Citellus beldingi* nests. They are frequently found associated with other fleas on ground squirrels in several States and have been found in regions where plague foci exist. These experimental findings on the susceptibility of fleas to plague infection after feeding on an infected host seem to warrant the conclusion that the proportion of fleas that will subsequently harbor the plague bacillus will vary according to the species involved.

Our attempts to transmit plague by feeding fleas on infected animals and then on healthy ones were entirely futile during the first 2 months of the experiments, although many of the fleas were found to be plague infected. The results were so constantly negative that the personnel engaged in the work began to question the theory that plague was transmitted by the bites of fleas. It was not until the rat fleas, *Xenopsylla cheopis*, were included in the study that positive results were obtained.

During the last half of the work, 20 guinea pigs died of plague following the bites of fleas; 16 were infected by *cheopis;* 2 by *fasciatus;* and one each was infected by *Diamanus montanus* and *Hoplopsyllus anomalus*. With the exception of *cheopis* and *Diamanus*, there were not sufficient numbers of infected fleas of each species to justify definite conclusions regarding their abilities to transmit plague when feeding. Only 9 of the 32 infected *cheopis* transmitted the infection; one of them infected 5 animals, of which 3 were infected on 3 successive days, while another infected 3 guinea pigs in 1 day. Had the infected *cheopis* been allowed to feed more frequently, they would have caused many more infections, because when one of these fleas is capable of transmitting plague it will infect an animal practically every time it inserts its proboscis. Although only two guinea pigs were infected by *fasciatus*, the transmissions followed the bites of 2 fleas out of only 5 known to have been infected, which makes a higher percentage of vectors among the *fasciatus* infected than among the *cheopis*. Both of these *fasciatus* were given opportunities to feed on days following that on which their bites were infectious, but neither one would attempt to feed again, thus differing markedly from the much more voracious *cheopis*. As only one of 12 infected *Diamanus montanus* transmitted the disease, it would appear that these fleas are much less efficient vectors of plague than either *cheopis* or *fasciatus*.

In 1914, Bacot and Martin reported that the plague bacillus multiplied in such large masses in the proventriculus of infected fleas that the esophagus became blocked so that blood could not enter the stomach and that, in the attempts of such fleas to feed, blood carrying bacilli was regurgitated and injected back into the host. In every case in which flea bites were infectious during last winter's experiments, except the one transmission by *Hoplopsyllus anomalus*, it was observed that, although the feeding period was longer than normal, or several attempts were made to feed, blood did not enter the stomachs of the fleas. Infected fleas that did not show this evidence of blockage never transmitted plague. In other words, the bites of plague-infected fleas are innocuous as long as blood can freely enter their stomachs. Even some of the fleas with blockage of the stomach did not transmit plague, as 12 of the *cheopis* were observed to be unable to obtain blood, but only 9 of them were vectors. It is possible that, owing to their weakened physical condition at the time when they attempted to feed, their efforts were not strong enough to cause regurgitation.

All *Xenopsylla cheopis* that transmitted plague showed evidence of obstruction to the stomach between the 9th and 26th days after ingesting infected blood. Those that were kept at a temperature of over 70° F. became blocked earlier than those kept at a mean temperature of 60° F. and so it would appear possible that increased temperatures hasten the multiplication of the plague organism in the proventriculus of *cheopis*. A much longer period elapsed after infection of all other species of fleas before their bites were infectious. *Hoplopsyllus anomalus* did not infect until the 35th day, *Nosopsyllus fasciatus* not until the 55th and 70th days, respectively, and *Diamanus montanus* not until the 84th day. During the interval between their infection and the time when they infected guinea pigs, the 2 *fasciatus* fed 39 times and the *Diamanus montanus* 25 times, securing blood in a normal manner. During the course of the experiments, 25 infected fleas from wild rodents fed 150 times without infecting guinea pigs. From these laboratory experiments it would appear that *cheopis* develop blockage earlier and more readily than do other fleas, which would tend to make them much more dangerous vectors of plague.

During the experiments only two fleas, both *cheopis*, infected guinea pigs on days following the one on which their bites were first infectious. One of them infected animals during a 2-day period and the other over an interval of 10 days; this latter flea was kept at a mean temperature of 60° F. Insofar as these observations go, it would seem that the bites of most plague-infected fleas are infectious for a very short time, probably not more than 1 or 2 days.

The average length of life of the 32 plague-infected *cheopis* was only 16 days, and with one reaching the maximum of 36 days. Under the conditions of these experiments uninfected *cheopis* may live for months; therefore plague is apparently a fatal infection to these fleas. Starvation due to blockage was not the only factor involved in causing their deaths, as many of them died within 4 days of the time they secured blood in a normal manner, while uninfected *cheopis* under observation at the laboratory at the same time would voluntarily starve from 12 to 20 days between normal feedings on human blood.

As regards the effects of plague on other species of fleas, all died within a short time after blockage; but when obstruction did not occur, and prior to its development, some of them survived long periods without any apparent bad effects from the plague organisms in their gastro-intestinal tracts Plague-infected fleas from *Peromyscus* and desert antelope ground squirrels survived for as long as 35 and 58 days, respectively, or about as long as they could be expected to live under laboratory conditions. These findings indicate that plague-infected fleas, with the exception of *cheopis*, may at times live for months, possibly long enough to carry the infection through the months that rodents are hibernating.

One rather interesting feature in connection with this study was the fact that all of the fleas which transmitted plague were females.

It cannot be positively stated that the bites of male fleas are never infectious, but the fact that 7 of the *cheopis* and 9 of the other fleas were plague-infected males and failed to infect guinea pigs is suggestive at least that male fleas do not readily act as vectors when feeding. None of the male *cheopis* showed evidence of blockage of the stomach, and they survived infection an average of only 14 days, indicating that plague undoubtedly shortened their existence. Two of them died immediately after obtaining blood in a normal manner or under conditions that were never observed among fleas that were uninfected.

Prior to the discovery that fleas may transmit plague when blood is regurgitated because of obstruction of the stomach, the most widely accepted theory of the mechanism by which fleas transmit the disease was one advanced by the Indian Plague Commission. According to this theory, the hosts, both human beings and rodents, were infected when the plague organisms present in the fecal deposits of infected fleas were rubbed into the minute wounds made by the insects' bites. Laboratory experiments have confirmed this theory to the extent that it has been possible to infect animals by rubbing infected feces into the skin at the site of flea bites. It is rather doubtful that man, who acts only as a temporary host for rodent fleas, is very frequently infected in this manner, as fleas seldom deposit feces when feeding and the reactions following the bites of rodent fleas rarely cause itching. On the other hand, it is difficult to understand how it is possible for the natural rodent hosts to escape infection when harboring fleas that are depositing infected feces on their skins over long periods of time. It would seem that the virulent organisms present in the feces would eventually gain access to the body through abrasions or be scratched or forced into the skin by the teeth of the animals in their efforts to rid themselves of parasites.

That virulent bacilli may be constantly present for long periods of time in the feces of plague-infected fleas was well illustrated by one of the *Diamanus montanus* used in the laboratory. This flea survived infection nearly 3 months, and during the last 2 months of its life its feces were inoculated into nine guinea pigs at about weekly intervals. All nine of the animals died of plague, but the guinea pig into which the dead flea itself was injected completely recovered after a short illness.

Fecal inoculation tests that have been conducted thus far seem to indicate that virulent bacteria are more constantly present in the feces of some species of fleas than in others. Plague followed every inoculation of feces deposited by infected *Diamanus montanus*, while less than one-third of the fecal inoculations of *fasciatus* gave positive reactions. Even the feces of infected fleas from desert antelope ground squirrels were found to be twice as infectious as those of *fasciatus* Out of four fecal tests of an infected flea from *Peromyscus*, one was followed by plague. The feces of *cheopis* gave positive reactions, but these fleas did not survive long enough to determine whether or not the results would be constant for any great length of time. Insofar as this study has gone, it would appear that when the plague bacillus once becomes established in the gastrointestinal tract of a flea, it continues to exist there until the death of the flea.

In connection with this subject it may be stated that the fecal deposits of different fleas vary in frequency and bulk. *Diamanus montanus* and *fasciatus* were observed to defecate more frequently and in greater amounts than other fleas, some of which did not deposit feces oftener than once every 2 or 3 days. It would seem that the infectiousness of flea feces might depend on two factors—first, the regularity with which virulent organisms are excreted, and, second, the frequency and amount of the fecal deposits. Our observations would indicate that plague-infected California ground squirrel fleas, *Diamanus montanus*, meet those specifications to a greater degree than do any of the other fleas studied.

According to statements in the literature on plague, the virulence of the organism is reduced by its habitat in the gastrointestinal tract of fleas, but our observations do not entirely support these ideas. Several guinea pigs infected by the bites of fleas died in less than 4 days, and the autopsy findings indicated a much greater degree of virulence than is usually evident when guinea pigs die of plague induced in them by other means. Animals infected by the bites of *cheopis* died more quickly than those infected by other fleas, but there was not a sufficient number of the latter infections to indicate that these findings had any particular significance. Inoculations of infected flea feces gave practically the same results as the use of infected tissues or cultures. In a way, the organisms excreted in the feces seemed to be somewhat more virulent than those remaining in the gastrointestinal tracts of the fleas that deposited the feces, as several guinea pigs into which the bodies of fleas were inoculated did not develop infection or recovered from a mild attack, while the feces of the same fleas caused death of other animals. These findings were the only ones indicating that virulence of the plague bacillus might be somewhat reduced in the stomach of fleas.

There has been considerable comment and speculation in recent years regarding the possibility that plague contracted from wild rodents was more likely to cause the pneumonic type of infection than that contracted from domestic rats. In regard to the localization of plague in the lungs it has been found that, since the use of flea inoculation to locate sylvatic plague foci and inoculations made in the course of experiments with infected fleas, autopsy examinations conducted at the Public Health Service laboratory in San Francisco have demonstrated more constant involvement of the lungs than was ever observed to follow the use of tissue or cultures. When the source of the organisms has been the gastrointestinal tracts of fleas, the macroscopical lesions of the lungs have been as common as those of the spleen. Lung pathology follows injections of the plague bacilli that have resided in domestic rat fleas just as frequently as the inoculations of organisms from wild rodent fleas. It therefore appears that plague bacilli which have developed in fleas are very prone to produce pathological lesions in the lungs of guinea pigs.

Besides the probable dissemination of plague among wild rodents through the agency of bites and infected feces, there are two other ways by which the infection may be spread. It is possible that plague sometimes follows the killing of parasites with the teeth, and the cannibalistic habits of some wild rodents undoubtedly account for a certain amount of plague infection among them. However, it is believed that plague epizootics will always be more widespread and severe when the transmission is caused by fleas that readily infect their hosts when feeding.

From the slight information now available regarding plague-infected fleas, it is possible to gain some idea regarding the reasons why plague outbreaks in different parts of the world have varied considerably. In the warm localities, where *Xenopsylla cheopis* are the only rat fleas found, plague epizootics have frequently had a tendency to subside rather quickly, or in accordance with the experimental observation that plague-infected *cheopis* do not survive very long and therefore cannot carry the infection over great intervals. As the bites of infected *cheopis* may readily transmit plague, the human incidence of infection will usually be rather high where these fleas are abundant.

In colder climates, where the *cheopis* infestation is low but *fasciatus* is present in relatively large numbers, plague outbreaks may be prolonged, with few human cases. The plague epizootic at Seattle offers an extreme example of this type of outbreak. Here plague smoldered slowly among the rats for 10 years, with only three human cases officially reported. Experiments show that *fasciatus* are only slightly susceptible to infection by the plague bacillus, but when infected they may carry the infection for 2 or more months before transmitting it, and so they are apparently capable of prolonging rat epizootics where they are associated with *cheopis*.

The unusually low human incidence of plague from wild rodent sources during the widespread dissemination of the sylvatic epizootics over the western part of the United States can hardly be explained unless it is considered that the parasites involved are rather inefficient vectors as compared with those responsible for domestic rat epizootics and the associated human epidemics. In the many years that sylvatic plague has existed in the United States, only about 40 human cases have been reported whose source of origin has been ascribed to wild rodents. Many of these cases have been infected by direct contact with the wild rodents and not through the agency of parasites, while the history of other cases indicates that they were infected by exposure to domestic rats. Just how many of these cases were caused by bites of infected fleas is a matter of conjecture, possibly less than half of them.

In California the ground squirrels harbor many more fleas than are ever found on domestic rats. These fleas will attack man when sufficiently starved, but not as readily as rat fleas. A field worker recently reported that, in a very short time, he had collected about 2,000 fleas from the mouths of ground squirrel burrows. This indicates the enormous number of fleas to which an individual may be exposed when walking through ground-squirrel infested fields. Such exposure must have commonly occurred in areas where epizootics have been in progress with very few, if any, cases of human plague developing.

Laboratory observations also support the idea that ground squirrel fleas do not readily transmit plague when feeding. For instance, 11 *Diamanus montanus* collected from *Citellus beecheyi* in San Mateo County, Calif., that were known to harbor the plague bacillus in their gastrointestinal tracts, fed a total of 66 times on guinea pigs with only one bite being infectious. It is possible that more wild rodents contract plague from infected flea feces, cannibalism, and by eating infected fleas than by the bites of fleas. The fact that it has been possible to obtain a large number of positive guinea pig inoculations from pooled specimens of fleas collected from several different rodent hosts, which showed no evidence of being infected themselves, yet which harbored infected fleas, strongly suggests that these infected insects may feed on their hosts without infecting them. If this is true of rodents, one would not expect that human infection would very often follow bites of wild rodent fleas.

In conclusion, it may be said that both epidemiological data and laboratory experiments indicate that the extent to which plague is transmitted depends upon the species of fleas involved. Those fleas which are most susceptible to plague infection of the gastrointestinal tract and to the bacterial obstruction of the esophagus are the most dangerous vectors. As long as the flow of blood to the stomach is not blocked, infected fleas may feed on their hosts without their bites being infectious; but there seems to be danger of infection from the virulent organisms present in the feces of all plague-infected fleas.

DEATHS DURING WEEK ENDED DEC. 25, 1937

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce

	Week ended Dec. 25, 1937	Corresponding week, 1936
Data from 86 large cities of the United States:		
Total deaths	8,631	8,548
Average for 3 prior years	9,049	
Total deaths, first 51 weeks of year	437,067	438,469
Deaths under 1 year of age	509	530
Average for 3 prior years	569	
Deaths under 1 year of age, first 51 weeks of year	27,897	28,191
Data from industrial insurance companies:		
Policies in force	69,971,632	68,974,371
Number of death claims	12,424	10,869
Death claims per 1,000 policies in force, annual rate	9.3	8.2
Death claims per 1,000 policies, first 51 weeks of year, annual rate	9.7	9.7

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (------) indicate that cases or deaths may have occurred although none was reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 1, 1938, and Jan. 2, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Jan. 1, 1938	Week ended Jan. 2, 1937	Week ended Jan. 1, 1938	Week ended Jan. 2, 1937	Week ended Jan. 1, 1938	Week ended Jan. 2, 1937	Week ended Jan. 1, 1938	Week ended Jan. 2, 1937
New England States:								
Maine	4	--------	6	3	35	8	1	0
New Hampshire	--------	--------	--------	--------	103	1	0	0
Vermont	--------	--------	--------	--------	179	--------	0	0
Massachusetts	3	5	--------	--------	96	654	2	2
Rhode Island	--------	1	--------	--------	--------	45	0	0
Connecticut	6	1	6	18	9	157	0	1
Middle Atlantic States:								
New York	42	28	[1] 17	[1] 487	189	220	12	6
New Jersey	20	13	20	26	675	278	2	4
Pennsylvania	39	50	--------	--------	3,330	59	5	5
East North Central States:								
Ohio	60	56	35	48	448	24	8	8
Indiana	26	21	35	322	88	5	0	1
Illinois	36	59	29	455	1,209	22	1	0
Michigan	23	41	3	12	647	41	1	2
Wisconsin	7	7	20	164	223	23	0	0
West North Central States:								
Minnesota	1	0	--------	7	7	21	1	0
Iowa	5	2	7	45	15	4	0	1
Missouri	50	23	67	189	1,644	8	2	2
North Dakota	2	--------	--------	--------	1	3	1	0
South Dakota	1	--------	1	9	--------	3	1	0
Nebraska	--------	2	--------	--------	4	2	1	2
Kansas	8	10	4	13	53	4	1	0
South Atlantic States:								
Delaware [2]	--------	2	--------	2	2	82	0	0
Maryland [3]	6	9	22	25	11	164	3	1
District of Columbia	5	5	4	3	8	11	0	2
Virginia	34	25	--------	--------	163	67	3	18
West Virginia	12	13	22	64	43	9	3	6
North Carolina [3]	35	61	18	46	558	38	2	5
South Carolina	3	3	311	400	249	13	0	0
Georgia [3]	10	17	--------	77	--------	--------	0	0
Florida [3]	30	11	2	4	23	1	3	12
East South Central States:								
Kentucky	6	15	22	57	127	9	5	32
Tennessee	25	25	120	108	251	31	1	5
Alabama [3]	17	19	371	121	41	2	11	7
Mississippi [3]	22	7	--------	--------	--------	--------	1	0

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 1, 1938, and Jan. 2, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Jan. 1, 1938	Week ended Jan. 2, 1937	Week ended Jan. 1, 1938	Week ended Jan. 2, 1937	Week ended Jan. 1, 1938	Week ended Jan. 2, 1937	Week ended Jan. 1, 1938	Week ended Jan. 2 1937
West South Central States:								
Arkansas	22	5	192	46	64	-------	0	0
Louisiana [3]	8	15	47	23	-------	14	3	1
Oklahoma [4]	15	3	114	72	-------	3	4	4
Texas [3]	45	55	444	362	23	127	2	5
Mountain States:								
Montana	-------	3	-------	282	2	3	0	0
Idaho [2]	-------	2	5	30	6	89	0	3
Wyoming	-------	-------	-------	300	-------	3	0	2
Colorado	6	5	-------	-------	96	7	1	2
New Mexico	8	4	5	15	61	1	0	0
Arizona	2	-------	90	65	2	50	0	0
Utah [2]	4	-------	-------	-------	57	80	0	1
Pacific States:								
Washington	7	5	-------	2	4	17	0	0
Oregon	1	-------	21	47	15	6	1	0
California	40	58	38	44	48	42	1	5
Total	696	692	2,107	3,903	10,899	2,451	83	119
52 weeks	27,892	28,771	292,271	160,030	302,242	284,033	5,390	7,411

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Jan 1, 1938	Week ended Jan. 2, 1937	Week ended Jan. 1, 1938	Week ended Jan. 2, 1937	Week ended Jan. 1, 1938	Week ended Jan. 2, 1937	Week ended Jan. 1, 1938	Week ended Jan. 2, 1937	Week ended Jan. 1, 1938
New England States:									
Maine	0	0	20	11	0	0	1	0	50
New Hampshire	0	0	17	17	0	0	0	0	8
Vermont	0	0	2	3	0	0	0	0	16
Massachusetts	0	0	252	176	0	0	3	0	80
Rhode Island	0	0	18	37	0	0	0	0	25
Connecticut	0	0	69	51	0	0	0	2	21
Middle Atlantic States:									
New York	1	0	449	610	0	35	9	4	253
New Jersey	0	1	114	125	0	0	3	2	117
Pennsylvania	1	0	430	530	0	0	6	11	210
East North Central States:									
Ohio	0	4	332	380	1	8	4	5	110
Indiana	0	0	134	194	69	7	1	2	12
Illinois	4	4	566	437	44	2	3	12	76
Michigan	4	1	564	520	0	0	1	11	200
Wisconsin	1	0	170	228	1	12	0	1	103
West North Central States:									
Minnesota	2	0	98	111	47	12	1	1	24
Iowa	0	0	141	84	19	12	0	3	15
Missouri	1	3	255	174	36	41	11	6	109
North Dakota	0	0	18	65	7	21	0	0	13
South Dakota	1	0	30	33	3	0	0	0	9
Nebraska	1	0	33	43	0	1	0	2	3
Kansas	0	2	233	270	7	21	1	1	47
South Atlantic States:									
Delaware [2]	0	0	14	12	0	0	1	0	5
Maryland [2]	0	0	35	68	0	0	5	3	46
District of Columbia	0	0	15	15	0	0	1	0	8
Virginia	0	1	67	38	0	0	9	7	85
West Virginia	0	1	44	41	0	0	1	5	12
North Carolina [3]	0	0	53	56	0	0	8	4	192
South Carolina	0	1	2	5	0	0	1	1	14
Georgia [3]	0	1	19	13	0	0	1	2	22
Florida [3]	1	2	20	12	0	0	4	0	4

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 1, 1938, and Jan. 2, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Jan. 1, 1938	Week ended Jan. 2, 1937	Week ended Jan. 1, 1938	Week ended Jan. 2, 1937	Week ended Jan. 1, 1938	Week ended Jan. 2, 1937	Week ended Jan. 1, 1938	Week ended Jan. 2, 1937	Week ended Jan. 1, 1938
East South Central States:									
Kentucky	1	1	55	40	0	0	0	1	32
Tennessee	3	0	36	44	5	0	2	2	35
Alabama [3]	1	1	10	19	6	0	4	5	6
Mississippi [2]	4	2	15	19	0	0	2	2	-------
West South Central States:									
Arkansas	3	1	40	4	5	0	10	3	38
Louisiana [2]	0	0	15	14	0	0	6	12	7
Oklahoma [4]	0	0	42	16	3	4	1	4	4
Texas [3]	0	1	75	75	2	0	9	11	142
Mountain States:									
Montana	0	0	16	71	10	24	3	2	34
Idaho [2]	0	0	21	19	34	17	0	3	60
Wyoming	0	0	27	28	1	1	0	0	5
Colorado	1	1	31	25	8	1	0	1	4
New Mexico	0	0	12	24	0	0	4	5	15
Arizona	0	0	11	7	0	0	2	0	9
Utah [2]	0	0	100	19	0	0	0	0	10
Pacific States:									
Washington	0	1	40	36	11	5	0	1	73
Oregon	0	0	37	44	6	22	1	0	10
California	5	4	171	215	20	5	10	14	179
Total	35	33	4,977	5,087	345	251	120	151	2,630
52 weeks	9,151	4,506	223,425	232,990	11,110	7,547	15,059	14,661	-------

[1] New York City only.
[2] Week ended earlier than Saturday.
[3] Typhus fever, week ended Jan. 1, 1938, 32 cases, as follows: North Carolina, 2; Georgia, 15; Florida, 2; Alabama, 8; Texas, 5.
[4] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
November 1937										
Arizona	1	37	232	2	22	-------	0	30	1	5
Hawaii Territory	0	16	85	-------	35	-------	0	-------	0	5
December 1937										
Delaware	0	1	-------	-------	7	-------	0	54	0	1

November 1937

	Cases
Arizona:	
Chicken pox	92
Dysentery	64
Mumps	15
Trachoma	16
Whooping cough	38
Hawaii Territory:	
Chicken pox	49
Conjunctivitis, follicular	277
Dysentery (amoebic)	1
Hookworm disease	5

November 1937—Continued

	Cases
Hawaii Territory—Con.	
Impetigo contagiosa	27
Jaundice, infectious	24
Leprosy	5
Mumps	14
Ophthalmia neonatorum	4
Paratyphoid fever	1
Septic sore throat	20
Trachoma	[illegible]
Typhus fever	4
Whooping cough	23

December 1937

	Cases
Delaware:	
Anthrax	1
Chicken pox	136
German measles	9
Mumps	42
Tularaemia	1
Whooping cough	52

WEEKLY REPORTS FROM CITIES

City reports for week ended Dec. 25, 1937

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	204	1,205	139	1,193	915	1,464	13	376	29	931	--------
Current week [1]	139	254	63	2,035	750	1,099	24	327	21	635	--------
Maine:											
Portland	0	--------	0	1	2	1	0	0	0	6	26
New Hampshire:											
Concord	0	--------	0	9	1	0	0	0	0	2	12
Manchester	0	--------	0	0	1	6	0	0	0	0	7
Nashua	0	--------	--------	2	--------	0	0	--------	0	0	7
Vermont:											
Barre	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Burlington	0	--------	0	0	0	0	0	0	0	4	7
Rutland	0	--------	0	2	0	0	0	0	0	2	11
Massachusetts:											
Boston	0	--------	2	43	25	51	0	9	0	5	233
Fall River	2	--------	0	0	2	0	0	1	0	16	28
Springfield	0	--------	0	2	4	10	0	2	0	10	44
Worcester	0	--------	0	1	2	7	0	3	0	6	36
Rhode Island:											
Pawtucket	0	--------	0	0	0	0	0	0	0	0	9
Providence	0	--------	0	2	3	21	0	5	0	13	81
Connecticut:											
Bridgeport	0	--------	0	1	0	8	0	1	0	0	31
Hartford	0	--------	0	0	2	20	0	1	0	3	26
New Haven	0	--------	0	0	1	2	0	1	0	3	35
New York:											
Buffalo	0	--------	1	2	17	19	0	6	0	21	146
New York	25	6	4	18	142	127	0	75	2	87	1,535
Rochester	0	--------	0	0	7	5	0	1	1	0	85
Syracuse	0	--------	0	0	4	7	0	0	0	6	52
New Jersey:											
Camden	0	1	1	0	2	4	0	0	0	1	42
Newark	0	4	0	1	9	10	0	2	0	15	80
Trenton	1	--------	0	80	5	1	0	1	0	3	42
Pennsylvania:											
Philadelphia	4	2	1	52	35	88	0	26	5	20	540
Pittsburgh	0	6	2	228	27	28	0	5	0	13	170
Reading	0	--------	0	1	0	4	0	2	0	2	34
Scranton	0	--------	--------	10	--------	1	0	--------	0	2	--------
Ohio:											
Cincinnati	1	--------	2	3	14	20	0	4	0	4	145
Cleveland	1	10	1	110	13	42	0	13	0	20	173
Columbus	2	--------	0	4	6	2	0	4	0	1	80
Toledo	1	2	1	31	8	5	0	3	0	4	90
Indiana:											
Anderson	0	--------	0	0	5	3	1	0	0	4	10
Fort Wayne	1	--------	0	2	2	5	0	1	1	0	24
Indianapolis	5	--------	3	7	20	16	0	3	0	0	119
South Bend	0	--------	0	1	5	5	0	0	0	0	12
Terre Haute	1	--------	0	2	0	0	0	0	0	0	23
Illinois:											
Alton	0	--------	0	17	0	5	0	1	0	1	9
Chicago	11	11	3	381	52	173	0	41	0	26	600
Elgin	0	--------	0	0	1	5	0	0	0	3	6
Moline	0	--------	0	17	1	6	0	0	0	0	8
Springfield	0	--------	0	14	0	4	0	0	0	0	15
Michigan:											
Detroit	9	3	1	173	32	77	1	7	2	54	257
Flint	0	--------	0	2	4	28	0	0	0	5	21
Grand Rapids	0	--------	0	1	3	14	0	0	0	4	38
Wisconsin:											
Kenosha	0	--------	0	2	0	2	0	0	0	9	11
Madison	0	--------	0	1	3	8	0	1	0	1	36
Milwaukee	0	--------	0	73	12	15	0	2	0	20	123
Racine	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Superior	0	--------	0	0	0	0	0	0	0	1	9

[1] Figures for Barre, Vt., Racine, Wis., and Boise, Idaho, estimated; reports not received.

City reports for week ended Dec. 25, 1937—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	0	0	3	2	0	0	1	6	19
Minneapolis	0	-----	0	0	9	19	0	2	0	0	101
St. Paul	0	-------	0	2	8	3	9	0	0	3	62
Iowa:											
Davenport	1	--- --	----	3	------	0	1	-----	0	0	--------
Des Moines	2	-	-	0	--	49	1	-----	0	0	39
Sioux City	0		-	0	-	2	0	-------	0	0	-------
Waterloo	0	--	- --	0		6	0	-------	0	0	--------
Missouri:											
Kansas City	1	2	1	9	8	20	0	4	0	1	120
St. Joseph	0	----	0	1	5	4	0	0	0	0	21
St. Louis	12	1	0	485	4	53	3	4	0	3	208
North Dakota:											
Fargo	0	-----	0	0	1	0	1	0	0	1	10
Grand Forks	0	- --	------	0	--- --	8	0	------	0	0	--------
Minot	0	----	0	0	0	0	0	0	0	9	6
South Dakota:											
Aberdeen	0	- -	-	0	-----	0	0	-------	0	0	--------
Sioux Falls	0	- --	0	0	0	0	0	0	0	0	15
Nebraska:											
Lincoln	1	--	---	0	---	6	0	- ---	0	0	--------
Omaha	0	--	0	0	3	2	0	1	0	0	59
Kansas:											
Lawrence	0	--	0	0	1	2	0	0	0	4	8
Topeka	0	- -	0	0	1	2	0	0	0	14	8
Wichita	0	-	0	2	2	1	0	0	0	0	21
Delaware:											
Wilmington	0	-	0	0	3	5	0	0	0	3	43
Maryland											
Baltimore	8	--	9	0	38	21	0	20	0	45	302
Cumberland	0	-	1	0	1	0	0	0	0	0	16
Frederick	0	-----	0	0	0	0	0	0	0	0	6
District of Columbia:											
Washington	6	5	0	8	7	8	0	8	1	3	135
Virginia:											
Lynchburg	5	--	0	0	4	0	0	1	0	2	15
Richmond	0	--	2	0	7	5	0	1	0	0	45
Roanoke	1	- -	0	2	0	0	0	0	0	0	15
West Virginia:											
Charleston	0	- -	0	2	1	1	0	0	0	0	7
Huntington	0	- - -		18	----	2	0	- - -	0	0	--------
Wheeling	0	--	0	0	4	5	0	2	0	3	22
North Carolina:											
Gastonia	0	1		0	--- -	0	0	- - -	0	1	--------
Raleigh	0	-	0	0	1	0	0	0	0	11	0
Wilmington	0	- -	0	0	3	0	0	0	0	2	20
Winston-Salem	0	--	0	0	0	1	0	2	0	11	13
South Carolina:											
Charleston	0	23	2	6	10	2	0	0	4	0	34
Florence	0		0	0	3	0	0	0	0	0	10
Greenville	0		0	0	4	1	0	0	0	7	17
Georgia:											
Atlanta	4	43	3	39	12	9	0	4	0	3	81
Brunswick	0		0	0	0	0	0	1	0	0	4
Savannah	1	60	2	0	2	3	0	2	0	0	37
Florida:											
Miami	2	1	0	20	2	2	0	1	0	0	28
Tampa	1	1	1	0	1	0	0	0	0	3	28
Kentucky:											
Covington	0	1	0	0	2	1	0	0	0	1	22
Lexington	0	-- .	0	2	4	1	0	1	0	0	18
Tennessee:											
Knoxville	0	1	1	1	3	1	0	3	0	0	22
Memphis	2	2	0	105	9	4	0	6	0	3	81
Nashville	0	---	0	2	9	5	0	0	0	2	52
Alabama:											
Birmingham	2	4	3	15	9	2	0	2	0	0	57
Mobile	1	-------	2	1	5	1	0	1	0	0	33
Montgomery	1	1	--------	0	--------	1	0	-------	0	0	--------

City reports for week ended Dec. 25, 1937—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Arkansas:											
Fort Smith	0	------	------	0	------	0	0	------	0	0	------
Little Rock	0	------	0	18	0	0	0	1	0	0	------
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	0	4
New Orleans	2	42	6	1	20	2	0	5	3	7	177
Shreveport	0	------	1	0	5	0	0	3	0	0	63
Oklahoma:											
Oklahoma City	1	------	0	0	7	3	0	1	0	0	48
Tulsa	1	------	------	0	------	9	2	------	0	1	------
Texas:											
Dallas	1	2	2	0	7	7	0	0	0	3	68
Fort Worth	3	------	0	0	4	15	0	0	0	0	29
Galveston	0	------	0	0	5	1	0	2	0	0	21
Houston	6	------	0	1	14	4	0	1	0	0	97
San Antonio	3	------	1	0	9	1	0	2	0	0	57
Montana:											
Billings	0	------	0	2	1	0	0	0	0	0	9
Great Falls	0	------	0	0	1	0	5	0	0	8	8
Helena	0	------	0	0	0	3	0	0	0	4	1
Missoula	0	------	0	0	1	0	0	0	0	0	4
Idaho:											
Boise	------	------	------	------	------	------	------	------	------	------	------
Colorado:											
Colorado Springs	0	------	0	0	1	2	0	0	0	5	11
Denver	8	------	3	65	8	18	0	5	0	4	81
Pueblo	0	------	0	2	1	1	0	0	0	1	10
New Mexico:											
Albuquerque	0	------	0	48	1	3	0	2	0	0	27
Utah:											
Salt Lake City	0	------	0	0	3	13	0	0	0	0	44
Washington:											
Seattle	1	------	0	0	4	4	0	7	0	31	91
Spokane	0	------	0	0	4	1	0	1	0	6	30
Tacoma	0	------	0	0	1	3	1	0	0	0	14
Oregon:											
Portland	0	2	0	2	0	7	1	3	0	0	79
Salem	0	1	------	0	------	1	0	------	0	0	------
California:											
Los Angeles	8	17	3	4	30	34	0	17	1	27	336
Sacramento	4	------	0	0	2	0	0	0	0	14	18
San Francisco	0	------	0	0	10	8	0	5	0	31	172

State and city	Meningococcus meningitis		Poliomyelitis cases	State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Maine:				Maryland:			
Portland	0	1	0	Baltimore	1	0	0
Vermont:				Kentucky:			
Rutland	0	1	0	Covington	1	1	0
New York:				Tennessee:			
Buffalo	3	0	0	Memphis	1	0	1
New York	2	0	0	Alabama:			
Pennsylvania:				Birmingham	3	0	0
Philadelphia	1	0	0	Arkansas:			
Pittsburgh	2	0	0	Little Rock	0	1	0
Ohio:				Louisiana:			
Cincinnati	3	2	0	New Orleans	2	0	0
Cleveland	2	1	0	Shreveport	0	1	0
Columbus	0	1	0	Texas:			
Illinois:				Houston	0	1	0
Chicago	2	0	1	Colorado:			
Michigan:				Pueblo	0	1	0
Detroit	0	0	3	Oregon:			
Minnesota:				Portland	1	0	0
St. Paul	0	0	1	California:			
Missouri:				Los Angeles	1	0	0
Kansas City	0	1	1				

Encephalitis, epidemic or lethargic.—Cases: New York, 2; Trenton, 1; Chicago, 1.
Pellagra.—Cases: Atlanta, 5; Savannah, 8; Tampa, 1; San Francisco, 1.
Typhus fever.—Cases: Atlanta, 1; Miami, 1.

FOREIGN AND INSULAR

CZECHOSLOVAKIA

Communicable diseases—September 1937.—During the month of September 1937, certain communicable diseases were reported in Czechoslovakia, as follows:

Disease	Cases	Deaths
Anthrax	6	----
Cerebrospinal meningitis	3	3
Chicken pox	39	2
Diphtheria	2,888	110
Dysentery	575	51
Influenza	49	2
Lethargic encephalitis	17	2
Malaria	345	----
Paratyphoid fever	26	----
Poliomyelitis	34	5
Puerperal fever	20	5
Scarlet fever	2,184	20
Trachoma	64	----
Tularaemia	----	1
Typhoid fever	1,124	69

JAMAICA

Communicable diseases—4 weeks ended December 25, 1937.—During the 4 weeks ended December 25, 1937, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities
Chicken pox	6	21
Dysentery	[1] 9	[2] 4
Erysipelas	2	2
Meningitis	----	1
Puerperal fever	1	1
Scarlet fever	----	2
Tuberculosis	37	68
Typhoid fever	3	53

[1] Includes 7 cases of amoebic dysentery.
[2] Includes 3 cases of amoebic dysentery.

TASMANIA

Vital statistics—Year 1936.—The following are vital statistics for Tasmania for the year 1936:

	Number	Rate per 10,000 inhabitants
Number of births	4,581	[1] 19.81
Deaths	2,387	103.4
Deaths under 1 year of age	227	[2] 49.6
Deaths from:		
Accident or negligence	120	5.2
Cancer	283	12.3
Diphtheria and croup	20	.9
Homicide	6	.3
Influenza	7	.3
Measles	7	.3
Scarlet fever	6	.3
Suicide	22	.9
Syphilis	10	.4
Tubercular diseases	135	5.8
Typhoid fever	1	
Whooping cough	11	.5

[1] Per 1,000 inhabitants.

[2] Per 1,000 births.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for December 31, 1937, pages 1952-1965. Similar cumulative tables will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

China—Shanghai.—Cholera has been reported in Shanghai, China, as follows: Week ended December 18, 1937, 3 cases; week ended December 25, 1937, 3 cases.

French Indochina.—Cholera has been reported in French Indochina, for the week ended December 25, 1937, as follows: Annam, 5 cases; Hanoi, 2 cases; Tonkin Province, 84 cases.

Plague

Belgian Congo—Dera.—During the week ended December 25, 1937, 2 cases of plague were reported in Dera, Lake Albert region, Belgian Congo.

Dutch East Indies—Java—Pasoeroean.—During the week ended November 6, 1937, 3 cases of plague with 3 deaths were reported in the mountain region near Pasoeroean, Java, Dutch East Indies.

Hawaii Territory—Island of Hawaii—Hamakua District.—Plague-infected rats have been found in Hamakua District, Island of Hawaii, Hawaii Territory, as follows: Hamakua Mill Sector—December 22, 1937, 1 rat: Paauhau Sector—December 20, 1 rat; December 22, 1 rat.

Peru.—During the month of November 1937, plague has been reported in Peru, as follows: Ancash Department, 3 cases, 3 deaths; Lima Department, 8 cases, 5 deaths; Libertad Department, 1 case.

Smallpox

Brazil—Santos.—During the week ended November 27, 1937, 1 case of smallpox was reported in Santos, Brazil.

Typhus Fever

Chile.—During the period October 3-23, 1937, 198 cases of typhus fever with 40 deaths were reported in Chile, among which were the following: Santiago Province, 84 cases, 28 deaths; Valparaiso Province—Baron, 10 cases; Ninhue, 17 cases, 2 deaths; Puerto, 1 case; Quinta Normal, 9 cases, 4 deaths; Renca, 8 cases; San Miguel, 13 cases, 2 deaths.

Yellow Fever

Nigeria—Enugu.—On December 21, 1937, 1 suspected case of yellow fever was reported in Enugu, Nigeria.

Sudan (French)—San.—On December 22, 1937, 1 case of yellow fever was reported in San, French Sudan.

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UNITED STATES TREASURY DEPARTMENT

PUBLIC HEALTH REPORTS

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IN THIS ISSUE

Summary of Current Prevalence of Communicable Diseases
The Blacktongue-Preventive Value of Whey and Cheese
An Experimental Study of Riboflavin Deficiency in Dogs
The Toxic and Vesicant Properties of Selenium Chloride

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UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

US-E-

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst Surg. Gen. ROBERT OLESEN, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PUBLIC HEALTH REPORTS

VOL. 53 JANUARY 21, 1938 NO. 3

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

December 5, 1937–January 1, 1938

The accompanying table summarizes the prevalence of eight important communicable diseases based on weekly telegraphic reports from State health departments. The reports from each State are published in the Public Health Reports under the section "Prevalence of Disease." The table gives the number of cases of these diseases for the 4-week period ending January 1, 1938, the number reported for the corresponding period in 1936, and the median number for the years 1932-36

DISEASES ABOVE MEDIAN PREVALENCE

Measles.– During the 4-week period ending January 1, 1938, 32,813 cases of measles were reported, as compared with 15,867 for the preceding 4 weeks. The number was almost five times that reported for the corresponding period in 1936 and more than three times the number in 1935. The current incidence was about 2.5 times the median incidence for 1932-36, which is a better comparison, since the number of reported cases of measles was unusually low in 1936 and also during the corresponding period in 1935. In the West South Central, Mountain, and Pacific regions the incidence was about normal, and in the New England region the number of cases was relatively low, but in all other regions the disease was unusually prevalent. In the Middle Atlantic and West North Central regions the number of cases reported was approximately four times the median incidence for this period in each region; in the East North Central region the incidence was about five times the median figure; and in the East South Central region the number of cases was about nine times the normal seasonal incidence for that region. The smallest increase was reported from the South Atlantic region, but even there the incidence was more than twice the average for the preceding years.

Scarlet fever.—The 18,928 cases of scarlet fever were only slightly in excess of the number reported for the corresponding period in 1936, which was a period of about average seasonal incidence. The larger number of the cases was reported from the Middle Atlantic and North Central States, with about a 20 percent increase over the expected incidence in the New England States. In the South Atlantic, South Central, and Western groups the incidence was about normal for this season of the year.

Influenza.—The number of cases of influenza rose from approximately 4,500 for the preceding 4-week period to approximately 7,500 for the 4 weeks ending January 1, 1938. Such an increase in this disease is normally expected at this season of the year, and the current incidence compares very favorably with the experience of recent years, being slightly below that for the corresponding period in 1936 and only about 10 percent above the 1933–36 median. More than one-half of the total number of cases were reported from the South Central States.

Number of reported cases of 8 communicable diseases in the United States during the 4-week period Dec. 5, 1937–Jan. 1, 1938, the number for the corresponding period in 1936, and the median number of cases for the corresponding period 1932–36 [1]

Geographic division	Current period	1936	5-year median	Current period	1936	5-year median	Current period	1936	5-year median	Current period	1936	5-year median
	Diphtheria			Influenza [2]			Measles [3]			Meningococcus meningitis		
United States [1]	2,551	3,031	4,013	7,481	7,985	6,760	32,813	6,801	13,942	317	405	241
New England	52	40	113	18	26	67	1,336	2,413	2,413	12	15	14
Middle Atlantic	329	355	531	97	152	133	13,459	1,344	3,589	55	62	30
East North Central	477	459	855	494	849	748	7,593	408	1,571	42	78	78
West North Central	229	184	395	316	308	353	4,521	167	1,075	18	27	27
South Atlantic	574	841	788	1,410	2,007	2,078	3,109	962	1,433	57	90	33
East South Central	269	367	409	1,415	796	809	1,219	132	132	76	47	24
West South Central	401	500	655	3,076	2,940	1,453	369	385	385	37	31	15
Mountain	80	65	95	354	441	228	857	812	1,201	7	20	10
Pacific	140	220	184	301	466	295	290	178	744	13	26	17
	Poliomyelitis			Scarlet fever			Smallpox			Typhoid fever		
United States [1]	134	201	185	18,928	17,630	18,237	1,338	636	518	497	754	754
New England	1	1	5	1,431	1,022	1,183	0	0	0	24	18	30
Middle Atlantic	8	9	31	3,685	3,385	4,241	0	76	1	89	103	103
East North Central	18	40	30	6,339	5,623	6,001	417	61	93	20	85	124
West North Central	23	19	13	3,157	2,955	1,801	498	220	171	37	68	62
South Atlantic	11	22	18	1,168	1,240	1,454	6	5	11	92	154	160
East South Central	25	25	9	523	502	788	36	1	15	27	127	93
West South Central	25	44	11	785	725	645	32	10	46	121	94	140
Mountain	5	7	5	801	735	735	249	111	76	32	59	59
Pacific	18	34	34	1,103	1,377	1,221	160	140	145	46	46	46

---

[1] 48 States. Nevada is excluded, and the District of Columbia is counted as a State in these reports.

[2] 41 States and New York City. The median is for the years 1933–36 only, the data for 1932 are not comparable.

[3] 46 States. Mississippi and Georgia are not included.

Meningococcus meningitis.—For the 4 weeks ending January 1, 1938, the number of reported cases of meningococcus meningitis was 371, as compared with 405 and 436 for the corresponding period in the years 1936 and 1935, respectively. The current incidence is slightly above the median incidence for this period, as the years 1934, 1933, and 1932, which fall within the median period, were years of low seasonal incidence. The disease was above the seasonal expectancy in the

Middle and South Atlantic Coast and South Central regions; below the median in the North Central and Pacific States and about normal in the New England and Mountain States.

Smallpox.—The number of cases of smallpox (1,338) reported for the current period was the highest recorded for the corresponding period in 6 years. The highest incidence was confined to States in the Mountain, Pacific, and North Central regions, with a slight rise above the normal seasonal incidence in the East South Central group of States. Of the total number of cases Indiana reported 267, Iowa 166, Illinois 121, Minnesota 115, and Idaho 101—more than one-half of the total cases occurring in those five States.

DISEASES BELOW MEDIAN PREVALENCE

Poliomyelitis.—The 134 cases of poliomyelitis reported for the current 4-week period represented a decrease from the total for the corresponding period in 1936 of about 35 percent, and was the lowest incidence reported for this period since 1932, when the incidence was approximately the same as for the current period. The West North Central region alone reported an increase over last year; in all other regions the incidence either closely approximated that of last year or fell considerably below it. The number of cases reported from the South Central States did not exceed that reported last year, but the incidence was considerably above the normal seasonal incidence for that area.

Diphtheria.—The incidence of diphtheria (2,551 cases) was the lowest recorded for this period in the 9 years for which these data are available. In the New England, North Central, and Mountain regions the current incidence was slightly above that for the corresponding period in 1936, but in relation to the 1932–36 median the current incidence was low in all sections of the country.

Typhoid fever.—Typhoid fever continued at a low level; 497 cases were reported for the current period, as compared with approximately 750 cases for the corresponding period in each of the years 1936 and 1935, and 1,039 in 1934. This disease has been considerably more prevalent in the West South Central region than it was in 1936, but that was apparently a "low" year for the disease in that region, and a better comparison is made with the 1932–36 median; the current incidence is about 20 percent below that. All other geographic divisions except the Pacific are low in relation to the 1932–36 median incidence.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ending January 1, 1938, based on data received from the Bureau of the Census, was 12.2 per 1,000 inhabitants (annual basis).

The average rate for the corresponding period in the 4 preceding years was also 12.2. In 1932 an epidemic of influenza raised the rate for this period to 13.3.

THE BLACKTONGUE-PREVENTIVE VALUE OF WHOLE WHEY, DELACTOSED WHEY, AND AMERICAN CHEESE *

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Goldberger, Wheeler, Lillie, and Rogers (*1*), showed that fresh skim-milk given to dogs on a blacktongue-producing diet in daily doses of approximately 30 cc per kilo of body weight prevented blacktongue in three out of five experimental animals for 1 year. Wheeler and Sebrell (*2*) conducted a similar experiment with canned evaporated milk in comparable daily doses (15 cc per kilo of body weight) and found a considerable delay in the onset of blacktongue in four out of five experimental animals. Booher and Hansmann (*3*), using a preparation obtained from a low lactose whey powder, were able to prevent blacktongue in one dog for 138 days, and successfully treated two dogs which had what were apparently mild symptoms of blacktongue.

Therefore, it was decided to test the blacktongue-preventive value of a whole whey powder, delactosed whey powder, and cheese.

Table 1.—*Composition of basic blacktongue-producing diet No. 123* [1]

Article of diet	Quantity	Nutrients		
		Protein	Fat	Carbohydrate
	Grams	*Grams*	*Grams*	*Grams*
Corn meal [2]	400	33.6	18.8	296.0
Cowpeas (*Vigna sinensis*) [3]	50	10.7	.7	30.4
Casein (purified) [4]	60	52.0		
Sucrose	32			32.0
Cottonseed oil	30		30.0	
Cod-liver oil	15		15.0	
Sodium chloride	10			
Calcium carbonate	3			
Total nutrients		96.3	64.5	358.4
Nutrients per 1,000 calories		40.1	26.9	149.3

[1] The corn meal, cowpeas (previously coarsely ground), and salt are stirred into water and cooked in a double boiler of enamelware for about 1½ hours. Then the other ingredients are well stirred in, the total weight being brought to 2,400 grams with water (so that 1 gram represents 1 calorie), and this finished mixture is served to the dog ad libitum.

[2] Whole maize meal (white) sifted as for human consumption.

[3] The variety known as the California black-eyed pea.

[4] Commercial casein leached for a week in daily changes of acidulated water, according to the method of McCollum, Simmonds, Shipley, and Park (Bull. Johns Hopkins Hosp., 33: 398 (1922)).

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*Editorial note.—This is another paper in a series of experimental studies designed to determine the blacktongue-preventive value of certain articles of food. The canine disease is thought to be identical with human pellagra.

EXPERIMENTAL

Through the courtesy of the Research Laboratories of Sealtest, Inc., and the Kraft Phoenix Cheese Corporation, we were furnished with a supply of whole whey powder, delactosed whey powder, and American cheese. The whole whey powder was obtained by the spray-drying process from milk produced in June. A portion of the same batch of whey was subjected to yeast fermentation in order to remove the lactose, and then spray-dried. The cheese was prepared in the same plant early in July. The analyses of the materials are given in table 2.

The yeast was not removed from the delactosed whey powder, and it was estimated to make up approximately 10 percent of the dry weight of the material. In the preparation of the whey powders it was calculated that 110 pounds of whole milk yielded 100 pounds of whey and 10 pounds of cheese, the whey having a dry weight of 7 pounds. After delactosing, the same quantity of whey yielded a preparation with a dry weight of 2.6 pounds. Hence, 1 gram of whole whey powder was recovered from 15.71 grams of whole milk; and 1 gram of delactosed whey powder was recovered from 42.31 grams of whole milk, while 1 gram of cheese was recovered from 11 grams of whole milk.

TABLE 2.—*Analyses of supplements* [1]

	Protein	Lactose	H_2O	Ash	Acidity as lactic acid	Ether extract	Riboflavin	
							Bourquin-Sherman units per gram	Gamma per gram [2]
	Percent	*Percent*	*Percent*	*Percent*		*Percent*		
Whole whey	12.24	72.74	4.77	7.79	2.07	0.61	10.6	36.0
Delactosed whey	35.82	.016	6.01	30.09	4.77	1.79	32.7	63.5
Cheese	23.41	.000	38.53	3.68	1.38	31.41		

[1] The analyses and data on the preparation of the whole whey and the delactosed whey powders were furnished us by Dr. Robert P. Myers and Dr. S. M. Weisberg of the Research Laboratories of Sealtest, Inc., Baltimore, Md. The cheese was analyzed in the Division of Chemistry of the National Institute of Health.

[2] Determined by the light absorption method.

WHOLE WHEY POWDER

A group of five dogs (Nos. 261, 267, 292, 333, and 334) were placed on our basic blacktongue-producing diet No. 123, the composition of which is given in table 1. The whole whey powder was fed as a daily supplement mixed with a small portion of the ration. The original daily dose was 2.5 grams per kilo of body weight, which was calculated to represent the equivalent of 39.3 grams of whole milk.

When symptoms of blacktongue developed in any animal, the supplement of all of the animals was increased until the daily dose of whole whey powder was 7.5 grams per kilo of body weight, or the equivalent of 117.8 grams of whole milk.

Three additional dogs (Nos. 320, 342, and 348) were added to the experiment later and received the 7.5 grams of whole whey powder per kilo of body weight throughout the experiment.

The significant details in regard to each of the experimental animals are as follows:

Dog No. 261

July 17, 1936: Begins diet 123 in good condition. Weight July 14 was 8.4 kilos. Begins daily supplement of approximately 2.5 grams of whole whey powder per kilo of body weight.

August 1: Fifteen days from the beginning of the experiment presents the first signs of an attack of blacktongue. An interrupted, red, band-like lesion on each side of the upper lip. The mucosa of the cheeks is diffusely injected, and the mucosa of the floor of the mouth is intensely red. The daily supplement of whole whey is increased to 5 grams per kilo of body weight.

August 3: The area of injection of the upper lip has become a continuous red band-like lesion. The mucosa of the cheeks and the floor of the mouth is very intensely injected and covered by thin pseudomembrane. The daily supplement of whole whey powder is increased to approximately 10 grams per kilo of body weight.

August 4: Weighs 7.5 kilos.

August 6: The buccal lesions have steadily progressed until the entire mucosa of the lips, cheeks, and the floor of the mouth is covered with thick pseudomembrane. There is considerable ropy salivation. The dorsal surface of the lateral margins of the tongue are red. The general condition is poor.

August 8: Moribund.

August 9: Found dead. Necropsy shows the typical lesions of advanced blacktongue.

Dog No. 267

July 17, 1936: Begins diet 123 in good condition. Weight on July 14 was 6.25 kilos. Begins daily supplement of 16 grams of whole whey powder (2.5 grams per kilo).

August 1: The daily supplement of whole whey is increased to 31 grams (5 grams per kilo).

August 11: Shows faint reddening of the mucosa of the upper lip and cheeks of doubtful significance.

September 14: For the past forty days has shown transient, slight reddening of the buccal mucosa, suggestive of incipient blacktongue. Today the daily supplement of whole whey powder is increased to 46.5 grams (7.5 grams per kilo of body weight at beginning of experiment).

September 15: Weighs 6.6 kilos.

November 7–21: Faint red band-like lesion on each side of the upper lip and erythema of the mucosa of the cheeks and floor of mouth, characteristic of early blacktongue. The lesions spontaneously receded.

December 1–April 13, 1937: Transient, variable injection of the buccal mucosa.

April 21: Discontinues diet 123 and daily supplement of whole whey powder 278 days from the beginning of the experiment. During the test period there were repeated recurrent buccal lesions, suggestive of mild blacktongue, which never progressed to a definite acute attack.

Dog No. 292

July 17, 1936: Begins diet 123 in good condition. Weight on July 14 was 8 kilos. Begins daily supplement of approximately 2.5 grams of whole whey powder per kilo of body weight.

August 1: Daily dose of whole whey increased to approximately 5 grams per kilo of body weight.

August 20: Thirty-four days from the beginning of the experiment presents first signs of an attack of blacktongue. Small reddened patches on the mucosa of each side of the upper lip opposite the canine teeth.

August 25: There is now a reddened band-like lesion about 1 inch wide on the left side of the upper lip, and several irregular patches of redness on the mucosa of the cheeks and the floor of the mouth.

September 1: The buccal lesions have receded.

September 8: Interrupted red band-like lesion on each side of the upper lip. Mild injection of the mucosa of the cheeks and floor of the mouth.

September 14: Whole whey powder supplement increased to approximately 7.5 grams per kilo of body weight.

September 15: Weighs 7.2 kilos.

September 16: The symptoms have progressed until now there is a continuous red band-like lesion extending along the mucosa on each side of the upper lip. The mucosa of the cheeks and the floor of the mouth is intensely red and covered by thick pseudomembrane. The scrotum presents a raised, sharply defined, desquamating area of dermatitis. There is a foul buccal odor and considerable salivation. Diarrhea.

September 17: The symptoms are progressing; the dog is in poor condition. Given 121.5 grams of whole whey powder dissolved in water by stomach tube on two occasions. Each dose was vomited.

September 18: Found dead. Necropsy reveals the typical lesions of advanced blacktongue.

Dog No. 333

July 17, 1936: Begins diet 123 in good condition. Weighed 6.8 kilos on July 14. Begins whole whey powder, 17 grams per day (2.5 grams per kilo).

July 28: Weighs 7.5 kilos.

August 1: Whole whey powder supplement increased to 34 grams per day (5 grams per kilo of body weight at beginning of experiment).

August 20–September 17: Varying degrees of slight, transient redness of the buccal mucosa of doubtful significance.

September 14: The daily dose of whole whey powder is increased to 51 grams (7.5 grams per kilo of body weight at beginning of experiment).

November 12, 1936–January 24, 1937: Again had variable slight reddening of the buccal mucosa which receded. Passed blood by bowel today.

February 18: First signs of an acute attack of blacktongue 216 days from the beginning of the experiment. Injection of the mucosa of the cheeks and each side of the upper lip. Intense injection of the mucosa of the floor of the mouth.

March 9: Intensely red patches on the mucosa of each side of the upper lip. The mucosa of the cheeks and floor of the mouth is intensely injected.

March 12: There is now a bright red band-like area on the mucosa extending along each side of the upper lip. The mucosa of the cheeks is moderately injected, and the mucosa of the floor of the mouth and the lateral surface of the tongue is intensely injected.

March 13: The buccal lesions are more intensely injected There is now pseudomembrane covering the mucosa of the cheeks. Removed from the experiment.

Dog No. 334

July 17, 1936: Begins diet 123 in good condition. Weight on July 14 was 4.4 kilos. Begins daily supplement of approximately 2.5 grams of whole whey powder per kilo of body weight.

August 1: Whole whey powder supplement increased to approximately 5 grams per kilo of body weight.

August 25: Slight injection of the floor of the mouth. Has not eaten well for the last 30 days.

September 8: Weighs 3 1 kilos.

September 9: Found dead. Necropsy: Extensive bilateral bronchopneumonia.

Dog No. 320

September 20, 1936: Begins diet 123 in good condition. Weight on September 15 was 5.0 kilos. Begins daily supplement of 37.5 grams whole whey powder (7.5 grams per kilo).

November 7: Has been observed at coprophagy.

November 17–December 1: Varying degrees of redness of the mucosa of the upper lip, cheeks, and floor of the mouth which did not become severe enough to warrant a definite diagnosis of acute blacktongue.

January 5, 1937: First sign of an attack of acute blacktongue 107 days from the beginning of the experiment. Faint injection of the mucosa of the upper lip and cheeks. Intense reddening of the mucosa of the floor of the mouth.

January 12: The mucosa of the right side of the upper lip is intensely injected, while that of the left side has a bright red patch opposite the canine tooth. The mucosa of the cheeks, floor of the mouth, and lateral surface of the tongue is intensely injected. There is some pseudomembrane on the mucosa of the right side of the upper lip. Weighs 4.5 kilos.

January 13: The buccal lesions have progressed and there is now pseudomembrane on the mucosa of the upper lip and both cheeks. Removed from the experiment.

Dog No. 342

September 20, 1936: Begins diet 123 in good condition. Weight on September 15 was 6.5 kilos. Begins daily supplement of approximately 7.5 grams of whole whey powder per kilo of body weight.

November 3: First sign of an acute attack of blacktongue 44 days from the beginning of the experiment. A diffuse injection of the mucosa of the cheeks and floor of the mouth. Weighs 6.25 kilos.

November 21: There are brilliant red patches on the mucosa of each side of the upper lip opposite the canine tooth. The remainder of the mucosa of the upper lip is diffusely injected. The mucosa of the cheeks, the floor of the mouth, and the lateral surfaces of the tongue is moderately injected.

November 25: The buccal lesions have steadily progressed and pseudomembrane now covers the reddened mucosa of the cheeks and the upper lip. Removed from the experiment.

Dog No. 348

September 20, 1936: Begins diet 123 in good condition. Weight on September 15 was 5.2 kilos. Begins daily supplement of 39 grams whole whey powder (7.5 grams per kilo).

April 21, 1937. During the 213-day test period the animal has had recurrent transient injection of the buccal mucosa of doubtful significance. Today the mouth is entirely clear. Discontinues diet 123 supplemented by whole whey powder.

Summary.—Three of the five dogs (Nos. 261, 292, and 233) starting the experiment on the 2.5 grams per kilo of body weight supplement of whole whey powder developed blacktongue in 15 days, 34 days, and 216 days, respectively, from the beginning of the experiment. One animal (dog No. 234) died of pneumonia, and one (dog No. 267) showed fleeting redness of the buccal mucosa, suggestive of incipient blacktongue, which first appeared 25 days from the beginning of the experiment. After the whey powder was increased to 7.5 grams per kilo of body weight, he finally completed a total test period of 278 days, with only recurrent fleeting symptoms suggestive of incipient blacktongue.

Two of the three dogs (Nos. 320 and 342) that began the experiment on a daily supplement of 7.5 grams of whole whey powder per kilo of body weight developed blacktongue in 107 days and 44 days, respectively, from the beginning of the experiment. The remaining animal (dog No. 348) completed a test period of 213 days, during which time he showed recurrent, fleeting redness of the buccal mucosa, suggestive of early blacktongue.

Therefore, whole whey powder in the quantity given must be regarded as a poor source of the blacktongue-preventive factor. Since it is impracticable to give doses larger than 7.5 grams per kilo of body weight, it appears that whole whey powder does not contain enough of the blacktongue-preventive factor to be of any practical significance.

DELACTOSED WHEY POWDER

A group of five dogs (Nos. 266, 288, 330, 332 and 335) were placed on our basal blacktongue-producing diet No. 123, the composition of which is given in table 1. The delactosed whey powder was fed as a daily supplement mixed with a small portion of the ration. The original daily dose was 1 gram per kilo of body weight, which was calculated to represent the equivalent of 42.31 grams of whole milk.

When symptoms of blacktongue developed in any animal, the supplement of all of the animals was increased until the daily dose of delactosed whey powder was 3 grams per kilo of body weight, or the equivalent of 126.9 grams of whole milk.

The significant details in regard to each of the experimental animals are as follows:

Dog No. 266

July 17, 1936: Begins diet 123 in good condition. Weight on July 14 was 7 kilos. Begins daily supplement of approximately 1 gram of delactosed whey powder per kilo of body weight.

August 11: Delactosed whey powder supplement increased to approximately 2 grams per kilo of body weight.

September 27: Since August 11 has shown varying degrees of redness of the buccal mucosa, suggestive of incipient blacktongue, which spontaneously receded. Today delactosed whey powder supplement increased to approximately 3 grams per kilo of body weight.

October 3. First sign of an acute attack of blacktongue 78 days from the beginning of the experiment. A faint, red band-like lesion on the mucosa of each side of the upper lip. Mucosa of the floor of the mouth diffusely injected.

October 6: There is a red band-like lesion about one-half inch wide on the mucosa of each side of the upper lip. Small necrotic areas are scattered along this injected lesion. The mucous membrane of the cheeks and the floor of the mouth are intensely injected, and there is much pseudomembrane on the cheeks. Weighs 7 kilos.

October 7: Lesions have progressed to pseudomembrane formation on the mucosa of the upper lip and the floor of the mouth, as well as on the cheeks. There are numerous areas on the buccal mucosa showing punctate hemorrhages. General condition is poor.

October 8: The animal's condition is progressively worse. Has extensive necrosis of the mucous membrane of the lips and cheeks. The margins of the tongue are quite red, and the mucosa of the floor of the mouth shows considerable necrosis and pseudomembrane. There is much salivation.

October 10: Found dead. Necropsy shows the typical lesions of advanced blacktongue.

Dog No. 288

July 17, 1936: Begins diet 123 in good condition. Weight on July 14 was 7.8 kilos. Begins daily supplement of approximately 1 gram of delactosed whey powder per kilo of body weight.

August 8–17: Varying degrees of slight reddening of the buccal mucosa which spontaneously receded.

August 11: Delactosed whey powder supplement increased to approximately 2 grams per kilo of body weight.

September 26: First signs of an acute attack of blacktongue 71 days from the beginning of the experiment. Large, bright red patches on each side of the upper lip opposite the canine teeth. The mucosa of the cheeks and floor of the mouth is fiery red. Given 4 grams per kilo of body weight of delactosed whey today only.

September 27: Delactosed whey powder supplement increased to approximately 3 grams per kilo of body weight.

September 29: Weighs 7.8 kilos.

September 30: Continues to have bright red areas on each side of the upper lip. The cheeks and the floor of the mouth continue very red, and there is a reddened patch on the dorsum of the tip of the tongue.

October 1: Lesions have progressed and pseudomembrane now covers the reddened areas on the mucosa of the upper lip and cheeks. The mucosa of the floor of the mouth remains intensely injected.

October 3: The buccal lesions are progressing, and there is considerable salivation.

October 5: General condition is poor. There is much salivation and extensive pseudomembrane on the mucosa of the upper lip and cheeks. The lateral margins of the tongue are bright red.

October 6: Moribund. Found dead later in the day. Necropsy shows the typical lesions of advanced blacktongue.

Dog No. 330

July 17, 1936: Begins diet 123 in good condition. Weight on July 14 was 7 kilos. Begins daily supplement of 7 grams delactosed whey powder (1 gram per kilo).

August 11: Delactosed whey powder supplement increased to 14 grams (2 grams per kilo).

September 27: Delactosed whey powder supplement increased to 21 grams (3 grams per kilo).

November 17, 1936–January 12, 1937: Showed transient, slight injection of the mucosa of the upper lip, or cheeks, or both.

April 21: Discontinues diet 123 and whole whey powder supplement 278 days from the beginning of the experiment.

Dog No. 332

July 17, 1936: Begins diet 123 in good condition. Weight on July 14 was 9 kilos. Begins daily supplement of approximately 1 gram of delactosed whey powder per kilo of body weight.

August 11: Weighs 10 kilos. Daily dose of delactosed whey powder supplement increased to 2 grams per kilo of body weight at beginning of experiment.

September 27: Delactosed whey powder supplement increased to 3 grams per kilo of body weight at beginning of experiment.

October 13: Weighs 10.4 kilos.

October 17: 92 days from the beginning of the experiment shows first signs of an acute attack of blacktongue. The mucosa of the cheeks and the floor of the mouth is quite red.

October 19: Buccal lesions have progressed rapidly. There are now large, brilliant red patches covered with thick pseudomembrane on the mucosa of each side of the upper lip opposite the canine teeth. There is also an interrupted red band on the mucosa of the upper lip on each side. The mucosa of the cheeks and floor of the mouth is very red, and covered by pseudomembrane. Removed from the experiment.

Dog. No. 335

July 17, 1936: Begins diet 123 in good condition. Weight on July 14 was 8.5 kilos. Begins daily supplement of 8.5 grams delactosed whey powder (1 gram per kilo).

August 11: Delactosed whey powder supplement increased to 17 grams daily (2 grams per kilo).

September 26: Given 4 grams per kilo of delactosed whey powder supplement today only.

September 27: Delactosed whey powder supplement increased to 25.5 grams daily (3 grams per kilo).

January 30, 1937: Since December 22 has shown recurrent, transient injection of the mucosa of the upper lip, cheeks, and floor of the mouth of doubtful significance, which spontaneously receded. Passed small amount of blood by bowel today.

February 2: Weighs 9.3 kilos.

February 9: First signs of an acute attack of blacktongue 207 days from the beginning of the experiment. A red patch on the mucosa on each side of the upper lip and on each cheek. The mucosa of the floor of the mouth is slightly injected. Weighs 8 kilos.

February 10: The reddened patch on the mucosa of the left side of the upper lip is larger, and more intensely injected; that on the mucosa of the right side of the upper lip has become a brilliant red band extending the length of that side of the lip. The mucosa of the cheeks is intensely reddened and covered with pseudomembrane. The mucosa of the floor of the mouth is intensely injected, and the soft palate is quite red. Removed from the experiment.

Summary.—Four of the five dogs (Nos. 266, 288, 332 and 335) developed the first signs of blacktongue in 78 days, 71 days, 92 days, and 207 days, respectively, from the beginning of the experiment. The remaining dog (No. 330) showed transient buccal symptoms suggestive of incipient blacktongue 123 days from the beginning of the experiment, which receded and reappeared throughout the experiment, although the animal completed an experimental period of 278 days without developing a definite acute attack of blacktongue.

Therefore, delactosed whey powder in the quantity given must be regarded as a poor source of the blacktongue-preventive factor. It appeared to be inadvisable to increase the daily amount of the delactosed whey to more than 3 grams per kilo of body weight, since the interpretation of the results might be difficult because of its 10 percent yeast content.

AMERICAN CHEESE

A group of five dogs (Nos. 352, 358, 363, 365, and 367) were placed on our basal blacktongue-producing diet No. 123. The cheese was broken up in small pieces and served separately before the ration was given. It was readily taken without difficulty. The original daily dose was 5 grams per kilo of body weight, which was calculated to represent the equivalent of 55 grams of whole milk.

On the first appearance of the symptoms of blacktongue in the experimental animals in 22 days (dog No. 363) the daily supplement of cheese was increased to 10 grams per kilo of body weight. The significant details in regard to each of the experimental animals are as follows:

Dog No. 352

January 6, 1937: Begins diet 123 in good condition. Weight yesterday was 7.5 kilos. Begins daily supplement of 5 grams of American cheese per kilo of body weight.

January 29: Weighs 8.7 kilos. Daily cheese supplement increased to 80 grams (approximately 10 grams per kilo of body weight).

February 11: Left 30 grams of cheese supplement.

February 16: First signs of blacktongue 41 days from the beginning of the experiment. The floor of the mouth is diffusely injected and there is a faint red patch on the left side of the upper lip. Weighs 9.5 kilos.

March 6: Left 40 grams of cheese supplement.

March 9: Buccal lesions have slowly but steadily progressed and there is now a red band-like lesion on the mucosa of each side of the upper lip. The mucosa of the cheeks and floor of the mouth is moderately injected.

March 11: Left 50 grams of cheese supplement.

March 13: Left 65 grams of cheese supplement.

March 14: Left all of cheese supplement.

March 15: Buccal lesions have continued to increase in severity. There are many small hemorrhagic and ulcerated areas on the mucosa of the upper lip which is intensely red. The mucosa of the cheeks is intensely injected and covered with pseudomembrane. The mucosa of the floor of the mouth is intensely injected. There is considerable salivation, and the saliva is blood tinged. Had bloody stool today. Removed from the experiment.

Dog No. 358

January 12, 1937: Begins diet 123 in good condition. Weighs 7.2 kilos. Begins daily supplement of 36 grams of American cheese (5 grams per kilo).

January 29: Daily cheese supplement increased to 72 grams (10 grams per kilo).

February 7: Passed blood by bowel.

February 11: Passed blood-stained material by bowel.

February 10–April 2: Left an average of 16 grams of cheese supplement daily.

April 6: First signs of an acute attack of blacktongue 84 days from the beginning of the experiment; a slight redness of the mucosa of the upper lip. Weighs 9.4 kilos.

April 9: Left 34 grams of cheese.

April 10: The buccal lesions have progressed very rapidly and the mucosa of the upper lip is intensely reddened and covered with pseudomembrane. The mucosa of the cheeks is covered with dense pseudomembrane, and the mucosa of the floor of the mouth is intensely injected. There is a foul buccal odor, and much salivation. Removed from the experiment.

Dog No. 363

January 6, 1937: Begins diet 123 in good condition. Weight yesterday was 8.9 kilos. Begins daily supplement of approximately 5 grams of American cheese per kilo of body weight.

January 26: Weighs 10 kilos.

January 28: First signs of an acute attack of blacktongue 22 days from the beginning of the experiment: A sharply outlined red bandlike lesion on the mucosa of each side of the upper lip. The mucosa of the cheeks is moderately injected, and the mucosa of the floor of the mouth is rather intensely injected.

January 29: The red band on the mucosa of each side of the upper lip is wider. The cheeks are covered with thin pseudomembrane, and the mucosa of the floor of the mouth is intensely red. There is a foul buccal odor. Removed from the experiment.

Dog No. 365

January 6, 1937: Begins diet 123 in good condition. Weight yesterday was 6.8 kilos. Begins daily supplement of approximately 5 grams of American cheese per kilo of body weight.

January 29: Weight 7.2 kilos. American cheese supplement increased to approximately 10 grams per kilo of body weight.

February 16–March 25: Has had transient and varying degrees of injection of the mucosa of the cheeks and the floor of the mouth, which spontaneously receded.

March 16 to July 10: Left on an average of 4.8 grams of cheese supplement per day.

July 27: Weighs 8.4 kilos.

July 30: Discontinued diet 123 and cheese supplement in good condition 205 days from beginning of experiment. At no time did the animal have symptoms that could be definitely diagnosed as blacktongue.

Dog No. 367

January 6, 1937: Begins diet 123 in good condition. Weight yesterday was 8.4 kilos. Begins daily supplement of approximately 5 grams of American cheese per kilo of body weight.

January 29: Daily supplement of American cheese increased to approximately 10 grams per kilo of body weight (90 grams). Weighs 9 kilos.

March 1–May 18: Left on an average of 24.9 grams of cheese per day.

May 18: First sign of an acute attack of blacktongue 132 days from the beginning of the experiment: Four discrete red patches on the mucosa of the upper lip. The mucosa of the cheeks is intensely injected, and small areas are covered with pseudomembrane. The mucosa of the floor of the mouth is intensely injected.

May 21: The buccal lesions have faded spontaneously and the mouth is now practically normal.

May 18–24: Left an average of 27 grams of cheese supplement per day.

May 24· There are several bright red patches on the mucosa of the upper lip. The mucosa of the cheeks and the floor of the mouth shows a rather intense, diffuse injection.

May 25: Has a continuous bright red bandlike lesion on the mucosa of the upper lip. The mucosa of the cheeks is intensely injected, and areas are covered with pseudomembrane. The mucosa of the floor of the mouth is intensely injected. Had a semiliquid tarry stool today. Removed from the experiment. Weighs 9.2 kilos.

Summary.—Four of the five dogs (Nos. 352, 358, 363 and 367) showed the first signs of an acute attack of blacktongue in 41 days, 84 days, 22 days, and 132 days, respectively, from the beginning of the experiment. The remaining animal (No. 365) had recurrent, transient attacks of reddening of the buccal mucosa, suggestive of incipient blacktongue, beginning 41 days from the beginning of the experiment, but completed the experimental period of 205 days without having a definite acute attack of blacktongue.

Therefore, American cheese in the quantity given is a poor source of the blacktongue-preventive factor. The quantity used (10 grams per kilo) apparently approached the limit which the animals would tolerate, and it did not appear that findings with a larger amount than this would be of any practical significance.

CONCLUSION

Whole whey powder, delactosed whey powder, and American cheese are poor sources of the blacktongue- (pellagra-) preventive factor.

REFERENCES

(1) Goldberger, Joseph, Wheeler, G. A., Lillie, R. D., and Rogers, L. M.: A study of the blacktongue-preventive action of 16 foodstuffs, with special reference to the identity of blacktongue of dogs and pellagra of man. Pub. Health Rep., 43: 1385 (1928).

(2) Wheeler, G. A., and Sebrell, W. H.: The blacktongue (canine pellagra) preventive value of fifteen foodstuffs. Natl. Inst. of Health Bull. No. 162, Part I., page 1, Govt. Printing Office, Washington, D. C., 1933.

(3) Booher, L. E., and Hansmann, G. H.: Vitamin G concentrates as preventives against blacktongue, with parallel studies of some concentrates in diets of white rats. Am. J. Physiol. 114: 429 (1936).

RIBOFLAVIN[1] DEFICIENCY IN DOGS

By W. H. SEBRELL, *Surgeon*, and R. H. ONSTOTT, *Passed Assistant Surgeon, United States Public Health Service, National Institute of Health*

Sebrell, Onstott, and Hunt (*1*) have presented preliminary evidence that riboflavin[1] deficiency produces a symptom complex in dogs, characterized by sudden collapse and coma, promptly followed by death, unless treated early with adequate doses of riboflavin. The striking similarity of symptoms and the finding of yellowish coloration of the liver at autopsy in one animal suggested that the condition previously described from this laboratory by Sebrell (*2*, *3*) as "yellow liver" was due to a riboflavin deficiency.

The experimental diets Nos. 330 and 341 used by Sebrell (*3*) contained relatively large amounts of rice polishings. Diet 330 contained 180 grams of rice polishings per 2,400-calorie ration, while diet No. 341 contained 400 grams per 2,400-calorie ration. All of the five dogs on diet No. 330 died, and at autopsy all presented the characteristic findings of "yellow liver." The time of onset of symptoms in these dogs was 162, 175, 240, 275, and 335 days, respectively, from the beginning of the experiment—an average of 238 days.

On the other hand, three dogs placed on diet No. 341 completed 1 year on the diet in good condition, were killed, and at autopsy failed to show any signs of "yellow liver."

The time of appearance of the symptoms of riboflavin deficiency in the four dogs on diet 123, supplemented with rice bran filtrate K–37–A, reported by Sebrell, Onstott, and Hunt (*1*), was 171, 196, 137, and 172 days, respectively—an average of 169 days from the beginning of the experiment.

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[1] Upon the recommendation of its Committee on Nomenclature, the Council on Pharmacy and Chemistry of the American Medical Association has adopted the name "Riboflavin" for the compound previously known as vitamin B_2. The name indicates that this compound is a ribose derivative of isoalloxazine, and prevents confusion with many synthetic products also called flavins but which are devoid of ribose.

The Council states that, while flavin was first isolated from egg white, the evidence is rather convincing that the flavins obtained from egg white, milk, liver, pancreas, and a number of other sources are identical in structure and manifest the properties of vitamin B_2. There appears to be a fairly general agreement among investigators in the field of vitamins who have discussed this question of nomenclature that the name "flavin" should be given to a water-soluble pigment that has been demonstrated to be necessary for the normal nutrition of the rat and for growing chicks.

The report of the Council appeared in the Journal of the American Medical Association, vol. 108, No. 16, p. 1340, April 17, 1937.

With these facts in mind, it was decided to conduct an experiment similar to some of the earlier work on "yellow liver," treating the animals with a preparation of riboflavin when symptoms of "yellow liver" appeared.

EXPERIMENTAL

Diet No. 465 was constructed to contain 135 grams of rice polishings per 2,400-calorie ration. If, as according to Munsell (*4*) and interpreted by Cowgill (*5*), rice polishings contain 4.2 international units of B_1 per gram, each ration of diet No. 465 contains 527 international units of B_1 or 175.67 international units for an average 800-gram serving. Calculated according to Cowgill (*5*),[2] the requirement of a 5-kilo dog is 7.49 international units per day, that of a 10-kilo dog is 17.64 international units per day, and that of a 15-kilo dog is 34.67 international units per day. Thus, it would appear that our diet 465 contains an adequate amount of vitamin B_1 for the dogs used in this experiment.

TABLE 1.—*Composition of diet No. 465*[1]

Article of diet	Percent of dry weight	Quantity	Nutrients		
			Protein	Fat	Carbohydate
		Grams	*Grams*	*Grams*	*Grams*
Rice polishings[2]	23.5	135.0	19.2	0.3	91.7
Casein (purified)[3]	13.9	80.0	72.5		
Sucrose	3.0	17.0			17.0
Cornstarch (commercial)	41.7	240.0			216.0
Cottonseed oil	11.5	66.0		66.0	
Cod liver oil	2.6	15.0		15.0	
Salt mixture[4]	3.8	22.0			
Total	100.0	575.0	91.7	87.3	324.7
Calories		2,400.0	368.0	732.0	1,300.0

[1] The rice polishings, cornstarch, and cottonseed oil are stirred into tap water and cooked in a double boiler of enamelware for about 1¼ hours. The other ingredients are well stirred in, the total weight being brought to 2,400 grams with water (so that 1 gram represents 1 calorie), and this finished mixture is served to the dogs ad libitum.

[2] Commercial rice polishings extracted with ether until the percolate is colorless.

[3] Commercial casein leached for a week in daily changes of acidulated water, according to the method of McCollum, Simmonds, Shipley, and Park (Bull. Johns Hopkins Hosp., 33: 308 (1922).)

[4] Prepared according to the method of Osborne and Mendel (J. Biol. Chem., 37: 557 (1919)).

Five dogs (Nos. 347, 357, 360, 362, and 364) were placed on diet No. 465, the composition of which is given in table 1. On the appearance of symptoms similar to those previously observed in this laboratory in connection with "yellow liver" of dogs (collapse or coma), each dog was treated with a preparation of riboflavin,[3] either by intramuscular or intraperitoneal injection. Several of the dogs became noticeably anemic during the experiment; and beginning on the 111th day after the experiment was started, weekly determinations of red blood cells and hemoglobin were made on all of the experimental animals. These results are shown in table 2.

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[2] Vitamin B_1 (international units per day) $= \frac{0.000076 \text{ (weight gm } 5/3)}{20}$.

TABLE 2.—*Red blood cells and hemoglobin*

Day of experiment	Dog No. 347		Dog No. 357		Dog No. 360		Dog No. 362		Dog No. 364	
	Red blood cells	Hemoglobin[1]	Red blood cells	Hemoglobin[1]	Red blood cells	Hemoglobin[1]	Red blood cells	Hemoglobin[1]	Red blood cells	Hemoglobin[1]
111	6,900,000	13 3	2,600,000	11 8	3,600,000	10 0	5,900,000	13.6	4,400,000	
118	7,300,000	13.5	[2]6,700,000	13.0	[3]6,500,000	11 5	5,200,000	12.5	[4]5,000,000	8.4
126	6,900,000	14.0			5,800,000	11 4	6,600,000	14 0	4,300,000	6.5
132	6,800,000	13 8			4,500,000	9 5	6,800,000	10 6	3,500,000	6.5
139	[5]7,800,000	13 6			5,300,000	10 5	6,400,000	13 3	5,100,000	7.4
146					5,700,000	9 6	5,700,000	12.6	5,400,000	7.8
153					6,000,000	11 5	7,000,000	11 8	4,600,000	7.8
160					5,700,000	11 5	5,600,000	15 2	4,900,000	5.8
167					[6]5,600,000	12 8	6,100,000	15 0	2,900,000	5.1
175					5,200,000	10 6	6,800,000	13 4	2,900,000	3.2
181					6,200,000	10 3	6,700,000	14 8	3,300,000	3.8
188					6,200,000	10 8	6,100,000	14 0	[7]3,600,000	3 6
195					5,700,000	10 8	6,500,000	13 6	3,600,000	4.4
202					[8]6,000,000	11.0	5,900,000	14 8	4,000,000	4.6
210							6,700,000	12.4	3,700,000	4.9
211					5,100,000	10.0				
216							6,400,000	13.6	3,700,000	4.7
217					4,800,000	10 2				
223							7,300,000	15 5	4,200,000	6 0
224					5,000,000	10.0				
230							6,600,000	14.9	4,800,000	5 5
231					[9]5,000,000	8 5				
237							6,000,000	15.5	5,400,000	7.0
238					5,600,000	9 0				
245							6,700,000	13.7	4,600,000	7.2
247					5,100,000	8 2				
252					[10]4,100,000	10.4	6,800,000	13 8	5,700,000	7.5

[1] Hemoglobin determinations according to Newcomer (J. Biol. Chem., 37· 465 (1918); 55: 569 (1923)).
[2] Acute attack 121st day Died 122d day.
[3] Acute attack 118th day.
[4] Acute attack 125th day.
[5] Acute attack 140th day, died.
[6] Acute attack 169th day.
[7] Acute attack 188th day.
[8] Acute attack 203d day.
[9] Acute attack 235th day.
[10] Acute attack 255th day.

When it was noticed that bradycardia and a sinus type of arrhythmia was a common finding, routine heart rate determinations were made. These results are shown in table 3.

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[3] Furnished through the courtesy of Mr. John Hart of the Winthrop Chemical Co., Inc.; packaged in glass sealed ampules containing 2 cc of a 0 05 percent solution and designated as L. F 356.

TABLE 8.—*Heart rates*

Day of experiment	Dog No. 347	Dog No. 357	Dog No. 360	Dog No. 362	Dog No. 364
118			[1] *80*		
121		*41, 40,* [1] *60, 218*			
122		*160*			
125					*118*
126	120				140
132	114		[1] 100	140	120
139	104		[1] 88	112	158
140	[1] *98, 58,* [1] *72*				
146			88	120	132
153			[1] 88	104	100
160			104	[1] 84	136
167			[1] 80	96	132
169			[1] *70,* [2] *228*		
170			[1] 86		
175				120	156
181			[1] 96	104	148
188			96	112	158, *82, 96,* [3] 93
189					147
195			[1] 92	120	132
202			84	110	158
203			[1] *86,* [1] *76*		
210			[1] 88 (211 days)	120	144
216			88 (217 days)	92	156
223			84 (224 days)	108	124
230			88 (231 days)	88	96
235			[1] *80,* [1] *74,* [1] *64,* [1] *84*		
237			[1] 72 (238 days)	120	136
245			96 (247 days)	108	124
252			96	116	120
255			[1] *64,* [1] *84,* [1] *80,* [3] 110		

Rates in italics were taken during an acute attack.

[1] Marked arrhythmia of the sinus type

[2] Following administration of atropin sulphate.

[3] Immediately after recovery from acute attack.

The significant details in regard to each of the experimental animals are as follows:

Dog No. 347

December 8, 1936: Begins diet No. 465 in good condition. Weighs 8.4 kilos.

January 26, 1937: The skin of the scrotum, flanks, and both axillae is reddened.

January 30: The redness of the skin lesions is fading. There is desquamation of the skin of the flanks, axillae, and scrotum.

February 4: Red desquamating lesions of the abdomen and the scrotum. The lesion on the scrotum now appears very similar to the scrotal lesion described in blacktongue.

February 9: The skin lesions have cleared up.

April 27: 140 days from the beginning of the experiment.

9:30 a. m.: Appears entirely normal except for a dry, scaly dermatitis of the scrotum. Weighs 8.7 kilos.

11:35 a. m.: Found lying on side in a semicomatose condition. Eyes open, able to lift head, reflexes hyperactive, slightly spastic, heart rate 98, respirations 10 per minute. Has exaggerated sinus type cardiac arrhythmia. Given 1 mg riboflavin (L. F. 356), diluted to 10 cc with normal saline, intramuscularly.

12:30 p. m.: Is in a deep coma. There is no response to mechanical stimuli.

2:45 p. m.: Is in deep coma. Respirations shallow and rapid. The heart rate is 58 per minute, with slight irregularity. Given 1 mg riboflavin (L. F. 356), diluted to 10 cc with normal saline, intramuscularly.

4:15 p. m.: Continues in a deep coma. Heart rate is 72 per minute, continues slightly irregular. Respirations are slow, have become shallow, jerky, and labored. No response to mechanical stimuli.

5 p. m.: Condition has become steadily worse. Coma is very deep. Respirations are quite shallow.

10 p. m.: Found dead. Placed in cold room.

April 28: Necropsy at 9:15 a. m.

NECROPSY

Gross findings: The dog is well nourished. The nose and mouth are stained with fluid which appears to be bloody. The skin of the abdomen is slightly erythematous, and there is a dry, branny, scaly dermatitis of the scrotum. Brain and cord appear normal, although the meninges are covered with a fibrinous blood-tinged exudate. The lower lobe of the right lung is markedly congested. There are congested areas throughout the upper lobe. The left lung has several small areas of congestion. Liver is of normal size and consistency, and presents a yellowish, mottled surface. The cut section is uniform and yellowish brown in color.

Intestines: There is an intussusception of the proximal jejunum and duodenum into the pyloric end of the stomach. The mucosa of the duodenum and pylorus is quite red, and there is some blood stained mucus in the stomach.

(Microscopic pathology under dog No. 357.)

Discussion.—The failure of this dog to respond to treatment with riboflavin (L. F. 356) may have been due to a combination of two factors. First, the initial dose of riboflavin was only 1 mg, and there was an interval of 3 hours and 10 minutes before a second dose of 1 mg was given. At the time the second dose was given the dog appeared moribund, so that the effective amount of riboflavin administered may have been too small. Second, the riboflavin was diluted to 10 cc with normal saline. This dilution may have rendered the absorption materially slower, so that in effect the dog may have received little flavin.

Dog No. 357

December 8, 1936: Begins diet 465 in good condition. Weighs 4.4 kilos.

April 7, 1937: Apparently normal in late afternoon.

April 8: 121 days from the beginning of the experiment, found apparently dead at 8:30 a. m. The animal was cold, and there were no visible respiratory movements. At 8:40 a. m. the animal was reexamined, and was found to be alive. There were no visible respiratory movements, but the heart was beating slowly. The animal was immediately given 2 mg of riboflavin (L. F. 356) intraperitoneally.

9 a. m.: Dog breathing, respirations 10 per minute, shallow, but regular. Heart rate 41 per minute, regular. Given 2 mg of riboflavin (L. F. 356) intramuscularly.

10 a. m.: In deep coma, heart rate remains about 40 per minute. Electrocardiogram[4] is normal except for inversion of the T-wave, and the slow heart rate.

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[4] Obtained through the courtesy of Capt. H. W. Smith of the Naval Medical School, Washington, D. C.

11 a. m.: Animal remains in deep coma. There is no movement, except respiration. Heart rate is 60 per mniute, but is quite irregular. Respiration 12 per minute.

1:30 p. m.: Observed having a convulsive seizure consisting of generalized tremors, clonic spasms, and opisthotonus.

5 p. m.: Still semicomatose, but attempts to rise and move about. Appears unable to move hindquarters, pulling self about the room with forelegs.

11 p. m.: Animal is in deep coma. Does not respond to stimuli.

April 9:

9:30 a. m.: Dog still alive, but is in deep coma. Heart rate 160 per minute, regular. Respiration slow and shallow. Given 1 mg of riboflavin (L. F. 356) in 200 cc of normal saline, intraperitoneally.

3 p. m.: Dog dead, without regaining consciousness. During the entire period of coma passed no urine.

NECROPSY

Gross findings: All tissues examined appear entirely normal with the following exceptions: *Brain*—Mild hyperemia of the meninges of the vault. *Lungs*—Moderate hypostatic congestion. *Liver*—The liver is normal in size and consistency. A marked yellowish mottling is present. No areas appear normal, some areas are almost a pure yellow color, others mottled yellow and pink. Cut section reveals an almost uniform yellowish gray color. *Bladder*—Collapsed and contracted. Contains no urine.

HISTOLOGIC PATHOLOGY

(By Surgeon R. D. LILLIE)

In two dogs studied histologically the brain and cord showed extensive and very moderate nerve cell degeneration, respectively, with tigrolysis, nerve cell vacuolation, and deposition of fine fat droplets in the cytoplasm. In the one (347) with the more extensive cellular degeneration Marchi preparations showed also some swelling, distortion, and blackening of a more or less numerous minority of myelin sheaths in certain levels of the pyramidal tracts in brain and cord, in parts of the median longitudinal bundles and brachium pontis in the pons, in radicular or root fibers of the glossopharyngeus and accessorius nerves, and in part of the fasciculus cuneatus in the cord. Exudative inflammatory changes were absent.

The livers showed diffuse deposition of fine and medium droplets of neutral fat in the liver cells as well as the normal fat in the bile duct epithelium. In one dog (347) there were also scattered coagulated necrotic liver cells, more in the lobule centers.

This dog showed also some tubular and glomerular necrosis while the other presented only a moderate vacuologranular degeneration of the convoluted tubules and the normal fatty epithelium in the coarse loop tubules.

Nodular hemorrhagic consolidation was present in the lungs of both, more extensive in the one (347) than in the other. The heart muscle was normal in both. The spleen was anemic and atrophic.

Femoral marrow was largely fatty in both, vertebral and sternal as well in the one (357) in which it was studied. Hypophyses showed chromophil preponderance in the pars anterior. In 357, stomach, large and small intestine and bladder showed no significant lesions.

The changes noted here are similar to those described previously by Lillie and Sebrell (*6*) in "yellow liver" of dogs. They are apparently more acute and accordingly more purely degenerative in so far as the central nervous system is concerned, but otherwise suggest the neuropathologic picture described by Zimmerman and coworkers (*7*, *8*).

Discussion (*dog No. 357*).—This dog was found comatose early in the morning, and was apparently dead when removed from the kennel. It was evident that he had been comatose for some time, as his body was quite cold. The failure of this dog to respond to treatment may be explained on the assumption that the condition had progressed too far when treatment was started. The dog rallied for a short period, and lived for 30½ hours after treatment was started. This relatively long survival period suggests that the treatment was not entirely without effect. The findings in the electrocardiogram obtained on this dog indicate that the bradycardia and the exaggerated sinus arrhythmia observed are due to some extracardiac cause.

Dog No. 360

December 8, 1936: Begins diet 465 in good condition. Weighs 6 9 kilos.

March 16, 1937: Weighs 7.3 kilos. Appears entirely normal with the exception of noticeable pallor of the buccal mucous membranes.

April 5: 118 days from the beginning of the experiment.

10 a. m.: Appears entirely normal with the exception of some pallor of the buccal mucosa.

3:20 p. m.: Seen standing in kennel.

3.30 p. m.: Found in deep coma. Heart rate 80 per minute, and there is an exaggerated sinus type of cardiac arrhythmia. Respiration 12 per minute, regular. Given 5 mg of riboflavin (L. F. 356) intramuscularly.

4:30 p. m.: Semicomatose. Attempts to rise on front legs, but movements are uncoordinated.

10 p. m.: Is able to stand but is rather unsteady.

April 6: Appears entirely normal. Is very active.

April 19: Pulse 100 per minute, irregular.

May 26: 169 days from beginning of experiment and 51 days from the previous attack.

10 a. m.: Seen jumping in kennel; apparently entirely normal.

1:30 p. m.: Found down, unable to rise, conscious, and moderately spastic. The reflexes are hyperactive. Heart rate 70 per minute, the sinus type of cardiac arrhythmia persists. Respirations 18 per minute, deep and regular.

1:35 p. m.: Given 3 mg of riboflavin (L. F. 356) intramuscularly.

1:53 p. m.: Heart rate is 70 per minute; has a marked sinus type of cardiac arrhythmia. Given 1/50 grain of atropin sulfate, subcutaneously.

1:58 p. m.: The heart rate is 228 per minute and regular.

2:40 p. m.: Is very spastic, able to stand on feet when placed on them, but unable to rise.

3 p. m.: Up on feet and walks around; somewhat unsteady. Allowed to wander about, and returned to kennel voluntarily.

May 27: Appears entirely normal. Heart rate is 86 per minute, and there is a sinus type of cardiac arrhythmia.

June 1: Appears normal.

June 28: Heart rate 84 per minute. Animal appears normal.

June 29: 203 days from the beginning of the experiment and 34 days from the previous attack.

10:15 a. m.: Found down, unable to stand or move legs. Heart rate 86 per minute. There is a marked sinus type of cardiac arrhythmia. Respirations 14 per minute and irregular.

11:06 a. m.: Given 2 mg of riboflavin (L. F. 356) intramuscularly.

12:35 p. m.: Had convulsion lasting about one minute, with extreme opisthotonus and involuntary urination.

2:10 p. m.: Is able to walk around, but is rather unsteady.

June 30: Appears entirely normal.

July 30: Appears entirely normal.

July 31: 235 days from beginning of experiment and 32 days from the previous attack.

8:55 a. m.: Found down in cage, unable to rise. Is moderately spastic. Heart rate 80 per minute, quite irregular (sinus type). Respirations 14 per minute.

9:17 a. m.: Heart rate 74 per minute, sinus arrhythmia.

9:37 a. m.: Given 2 mg of riboflavin (L. F. 356) intramuscularly. Had convulsive seizure within 1 minute, with involuntary urination.

12:30 p. m.: Returned to kennel able to stand and run about; is well oriented, but slightly unsteady.

August 1: Very active. Appears entirely normal. Has a sinus arrhythmia.

August 19: Appears entirely normal.

August 20: 255 days from the beginning of the experiment and 20 days from the previous attack.

9:00 a. m.: Appeared normal.

2:25 p. m.: Seen standing in kennel in apparently catatonic condition. Moderate general spasticity. Heart rate 64 per minute. Respiration 24 per minute.

3:00 p. m.: Very spastic. Able to stand if placed on feet. Apparently has difficulty keeping eyes open. Heart rate 80 per minute; sinus arrhythmia. Respiration 54 per minute.

3:30 p. m.: Unable to stand; semicomatose. Given 0.5 mg of riboflavin (L. F. 356) intravenously and 1.5 mg intramuscularly.

3:55 p. m.: Spasticity has disappeared. Breathing normally, able to walk but is unsteady.

4:09 p. m.: Heart rate 110 per minute, exaggerated sinus type of cardiac arrhythmia. Appears weak and unsteady, but returns to kennel unassisted.

August 21: Active, jumping in kennel. Appears entirely normal.

Discussion.—This dog has been successfully treated with riboflavin (L. F. 356) in five successive attacks of coma. During one of the attacks, 1/60 grain of atropin sulfate, administered subcutaneously, immediately stopped the bradycardia and the exaggerated sinus type of arrhythmia, indicating that these cardiac dysfunctions may be due to a vagotonia.

The first dose of 5 mg of riboflavin (L. F. 356) carried the dog 51 days before a second attack. The second dose of 3 mg of riboflavin (L. F. 356) carried him 34 days before the third attack occurred. The third dose of 2 mg of riboflavin (L. F. 356) carried him 32 days before the fourth attack. The fourth dose of 2 mg carried him 20 days before the fifth attack.

Dog No. 362

December 8, 1936: Begins diet 465 in good condition. Weighs 6.3 kilos.

January 26, 1937: The skin of the chest and the abdomen is quite red. Weighs 8.2 kilos.

January 30: There is redness and partial loss of hair involving the muzzle and the entire ventral surface of the body, including the medial surface of the legs and the axillae.

February 1: Given 72 grams of American cheese by mistake.

February 16: The condition of the skin of the ventral surface of the body is unchanged. Weighs 9.1 kilos.

May 4: Condition of the skin remains unchanged. Weighs 11.8 kilos.

August 17: Weighs 14.6 kilos. 252 days from the beginning of the experiment the animal continues to have a reddened condition of the skin of the muzzle, chest, and abdomen, including the medial sides of all four legs. The hair is thin and short. Otherwise the animal appears entirely normal.

December 11: Found in coma. Given 2 mg riboflavin (L. F. 356).

December 12: Found dead. Typical "yellow liver" at autopsy.

Discussion.—This animal was on the experimental diet a total of 369 days. The dermatitis may or may not have been due to the specific deficiency under consideration. The animal was watched for coprophagy, but this was not observed. It is to be noted that this animal more than doubled his weight while on the experimental diet. The effect of the accidental feeding of 72 grams of American cheese on February 1 is difficult to evaluate. Cheese has been reported by Day and Darby (*9*) to be a good source of riboflavin.

Dog No. 364

December 8, 1936: Begins diet 465 in good condition. Weighs 4.5 kilos.

April 5, 1937: Has a small ulcerated area on the lateral surface of each foreleg over the wrist joint. Heart rate is very rapid and irregularity makes counting uncertain.

April 12: 125 days from the beginning of the experiment.

7:30 a. m.: Is quite weak, but is able to walk.

8:45 a. m.: Spastic, unable to rise to feet, but when placed on feet is able to stand. The hindquarters seem rather weak.

9 a. m.: Very spastic; unable to walk. "Settles down" gradually when placed in sitting position.

9:15 a. m.: Unable to stand. Moves legs and head with great difficulty. Head can be moved passively with difficulty due to the marked spasticity. Is conscious. Heart rate 118 per minute; regular.

9:20 a. m.: Given 2 mg of riboflavin (L. F. 356) intramuscularly.

10:40 a. m.: The dog is up on his feet, has lost all spasticity, and appears to be entirely normal in every respect. Is very active.

April 13: Appears to be entirely normal.

April 27: Weighs 4.4 kilos. Ulcers over wrist joints have completely healed.

June 14: 188 days from beginning of experiment and 63 days from the previous attack. Appears normal at 9.30 a. m. Heart rate is 158 per minute.

1:45 p. m.: Found down in cage, unable to get up.

2 p. m.: Placed on feet; walked a few steps with extreme difficulty. Heart rate 82 per minute. Respirations 20 per minute.

2:07 p. m.: Given 1 mg of riboflavin (L. F. 356) intramuscularly.

2:35 p. m.: Heart rate is 96 per minute. Neck is rigid; unable to stand; semicomatose.

3:25 p. m.: Given 1 mg of riboflavin (L. F. 356) intraperitoneally.

3:45 p. m.: Able to walk. Heart rate 93 per minute. Respirations 24 per minute.

June 15. Appears to be entirely normal (with the exception of pallor of the buccal mucosa). Heart rate is 147 per minute.

August 17: Weighs 4.3 kilos. In good condition.

Discussion.—This animal has had two attacks of collapse, and each time has made a rather dramatic response to the administration of riboflavin. The first dose of 2 mg carried him a total of 63 days before the occurrence of the second attack.

SUMMARY

All of the five dogs on experimental diet No. 465 have developed a symptom complex similar to that previously described from this laboratory by Sebrell (*2*, *3*) as "yellow liver" and by Sebrell, Onstott, and Hunt (*1*) as "riboflavin deficiency." The symptoms appeared in dogs No. 347, 357, 360, 362, and 364 in 140, 121, 118, 369, and 125 days, respectively, from the beginning of the experiment. Three of the dogs (Nos. 347, 362, and 357) died in the first attack in spite of the treatment administered. One of the remaining two dogs (No. 360) had five successive attacks of coma, and the other (No. 364) had two attacks of coma. All of these attacks were immediately relieved by treatment with riboflavin (L. F. 356).

The electrocardiogram obtained on dog No. 357 while in an attack of coma was normal with the exception of the extremely slow rate (40 per minute), an inversion of the T-wave, and a regular irregularity of the sinus type. This finding indicates that the cause of the bradycardia and arrhythmia is extracardiac.

One dog (No. 360) was treated with $\frac{1}{50}$ grain of atropin sulfate subcutaneously during an attack. At the time of administration the pulse rate was 70 per minute and there was a marked sinus type of arrhythmia. Within 5 minutes the pulse rate was 228 per minute and regular. This suggests that the bradycardia and the arrhythmia are vagotonic in origin.

An analysis of the data given in table 2 indicates that an anemia of the hypochromic type develops in dogs on diet 465. The degree and course of the anemia, as indicated by weekly red blood cell counts and hemoglobin determinations, and the fact that there was no constant and material improvement in the blood picture following the administration of relatively large doses of riboflavin suggests that the anemia may be due to some other factor.

In our experience with riboflavin-deficient diets given dogs in this laboratory, we have never seen collapse occur in less than 102 days. It is necessary, presumably, to deplete the animal's store of riboflavin before the acute symptoms develop. During the depletion period the animals developed an inconstant dermatitis consisting of erythema, followed by a dry, flaky exfoliation. In male dogs, this dermatitis has involved the scrotum; otherwise it is apparently most common on the chest, abdomen, the insides of the thighs, and the axillae.

The symptoms characteristic of the acute attack develop rapidly, and death occurs within a few hours. There is a sudden onset of weakness with ataxia, and very soon the animal is unable to stand or move his legs. At this time there is a varying degree of spasticity, which is at times marked. Apparently the animal is fully conscious, since it will follow activity in the room with its eyes and attempt to move the head or wag the tail. There is no evidence of pain or discomfort. There is bradycardia and an exaggerated sinus type of cardiac arrhythmia (the heart speeding up on inspiration and slowing on expiration), probably due to a vagotonia. The respiration is slow and regular.

The condition advances rapidly, so that within an hour the animal has usually passed into a deep coma, in which there is no response to stimulation. The pulse becomes slower and the breathing more shallow and labored. The animal will remain in this condition for several hours until death intervenes. We have never seen an animal survive more than 12 hours without treatment with riboflavin. Before death the heart rate is slowed even more, being observed as slow as 40 per minute, and the respirations are extremely shallow and labored. Death is apparently precipitated by respiratory failure.

No accurate estimate of the amount of riboflavin necessary for the dog can be made from this data. With the relatively enormous doses given in the treatment of the animals in this experiment, it is probable that some was excreted, and the amount given therefore cannot be considered as being a minimum requirement. Then again, our diet 465 undoubtedly contains a small amount of riboflavin. It is interesting to note, however, that in two dogs receiving doses of 2 mg (the smallest successfully used) one, weighing on an average of 4.4 kilos, was carried for 63 days before the next succeeding attack; and the other, weighing on an average of 6.9 kilos, was carried for 32 and 20 days before the next succeeding attacks.

CONCLUSIONS

1. A symptom complex in dogs, similar to that previously described from this laboratory as "yellow liver," characterized by bradycardia, cardiac arrhythmia, collapse, and coma, rapidly followed by death with characteristic necropsy findings, which include a yellow mottling of the liver and degenerative changes in the central nervous system, has been produced in dogs on a diet low in riboflavin.

2. The condition is alleviated by early parenteral administration of riboflavin.

REFERENCES

(1) Sebrell, W. H., Onstott, R. H., and Hunt, D. J.: The treatment of blacktongue with a preparation containing the "filtrate factor," and evidence of riboflavin deficiency in dogs. Pub. Health Rep., 52: 427 (1937).

(2) Sebrell, W. H.: Fatty degeneration of the liver and kidneys in the dog apparently associated with diet. A preliminary note. Pub. Health Rep., 44: 2697 (1929).

(3) Sebrell, W. H.: "Yellow liver" of dogs (fatty infiltration) associated with deficient diets. Natl. Inst. of Health Bull. No. 162, Part III, page 23. Govt. Printing Office, Washington, D. C., 1933.

(4) Munsell, Hazel E.: Rice polishings as a source of vitamin B. A preliminary report. J. Home Economics, 21: 124 (1929).

(5) Cowgill, G. R.: The Vitamin B Requirements of Man. Yale University Press, New Haven, 1934.

(6) Lillie, R. D., and Sebrell, W. H.: Pathology of yellow liver of dogs. Natl. Inst. of Health Bull. No. 162, Part IV, page 37. Govt. Printing Office, Washington, D. C., 1933.

(7) Zimmerman, H. M., and Burack, E.: Studies on the nervous system in deficiency diseases. II. Lesions produced in the dog by diets lacking the water-soluble, heat-stable vitamin B_2 (G). J. Exp. Med., 59: 21 (1934).

(8) Zimmerman, H. M., Cowgill, G. R., and Fox, J. C., Jr.: Neurologic manifestations in vitamin G (B_2) deficiency. An experimental study in dogs. Arch. Neurol. and Psychiat., 37: 286 (1937).

(9) Day, P. L. and Darby, W. J.: Cataract-preventive vitamin (flavin) in cheese. Food Research, 1: 349 (1936).

TOXICOLOGY OF SELENIUM

V. TOXIC AND VESICANT PROPERTIES OF SELENIUM OXYCHLORIDE[1]

By H. C. Dudley, *Assistant Biochemist, United States Public Health Service*

The unique chemical properties of selenium oxychloride have brought this substance into recent public notice although its use as a solvent and plasticizer has been known for some time (*1*). The projected use of selenium oxychloride in industry makes advisable a study of its toxic and vesicant action on skin contact.

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[1] From the Division of Industrial Hygiene, National Institute of Health.

The preceding articles of this series are as follows:

I. A study of the distribution of selenium in acute and chronic cases of selenium poisoning. By H. C. Dudley. Am. J. Hyg., *23:* 169 (1936).

II. The urinary excretion of selenium. By H. C. Dudley. Am. J. Hyg., *23:* 181 (1936).

III. Determination of selenium in air-gas dust mixtures. By H. C. Dudley. Am. J. Hyg., *24:* 227 (1936).

IV. Effects of exposure to hydrogen selenide. By H. C. Dudley and John W. Miller. Pub. Health Rep., *52:* 1217 (1937).

Selenium oxychloride, $SeOCl_2$, is a pale yellow liquid, when pure, which gives off fumes of HCl on exposure to humid air. Some of its physical properties are as follows: Molecular weight, 166.11; melting point, 10.8° C.; boiling point at 744 mm Hg, 177.2° C. (decomposition); density, 2.42; vapor pressure, 0.048 mm at 20° C. (calculated).

On contact with water or water vapor, selenium oxychloride rapidly hydrolyzes in the following manner:

$$SeOCl_2 + H_2O \longrightarrow 2HCl + SeO_2$$
$$SeO_2 + H_2O \longrightarrow H_2SeO_3$$

Selenium oxychloride is soluble in carbon tetrachloride, chloroform, carbon disulfide, and benzol, forming physical mixtures with these solvents. It is a powerful chlorinating and oxidizing agent, reacting with many inorganic and organic materials, including protein materials, leather, wool, natural and synthetic resins, phenol-formaldehyde resins, and most metallic substances (*2*, *3*, *4*).

The studies reported here consist of the determination of the toxic dose for rabbits by skin application, and a determination of the selenium content of the blood and liver of two rabbits receiving amounts of selenium oxychloride sufficient to cause death. In addition, there are presented the results of the application of a small amount of pure $SeOCl_2$ to the forearm of a man.

A. TESTS ON RABBITS

Accurately measured quantities of selenium oxychloride (Baker's reagent) were placed on a clipped area on the backs of normal rabbits weighing from 1,688 to 3,369 gm. The quantity of the reagent was measured by standard capillary pipettes, 0.1 and 0.01 cc. The reagent was allowed to spread over as large an area as possible. The 0.01 cc portion spread over a circular area approximately 1 cm in diameter; the larger quantities gave areas of application of proportionally larger size. The rabbits, after treatment, were placed in cages and their condition and time of death were noted.

In table 1 are shown the results of the skin applications of $SeOCl_2$ to clipped areas on the backs of normal rabbits. From these data it is concluded that the amount necessary to cause the death of rabbits is less than 0.01 cc. When computed on a weight basis, the toxic dose of $SeOCl_2$, by skin application, for rabbits is less than 7 mg/kilo. The difficulties encountered in preventing rapid hydrolysis of the $SeOCl_2$ when measuring quantities less than 0.01 cc caused the results to be unreliable. For this reason, no figure for the minimum lethal dose of $SeOCl_2$ is given, except to state that this figure is less than 7 mg/kilo. When $SeOCl_2$ was dissolved in anhydrous carbon tetrachloride and applied to rabbits in a manner similar to that just described, moderately severe burns resulted. However, there was no marked or deep tissue destruction as occurred when the undiluted $SeOCl_2$ was applied, nor was death caused even when proportionate toxic amounts were applied. For these reasons, the results of skin tests made on rabbits, using a $SeOCl_2—CCl_4$ mixture, are omitted. The results were inconclusive and misleading when compared with the action of undiluted $SeOCl_2$.

TABLE 1.—*Mortality data. Deaths resulting from skin application to rabbits of* $SeOCl_2$

Rabbit No.	Weight	$SeOCl_2$ applied	$SeOCl_2$ per kilo [1]	Results
	Grams	*Cc*	*Cc*	
1	1,945	0.20	248	Dead in 5 hours.
2	1,688	.10	143	Dead in 5 hours.
3	2,776	.04	34.9	Dead in 2 hours.
4	2,788	.03	26.0	Dead in 3 hours.
5	2,647	.02	18.2	Dead in 5 hours.
6	2,270	.01	10.6	Dead in 20 hours.
7	2,330	.01	10.4	Dead in 20 hours.
8	2,563	.01	9.4	Dead in 20 hours.
9	2,658	.01	9.1	Dead in 20 hours.
10	3,369	.01	7.2	Dead in 20 hours.

[1] Calculated from density of $SeOCl_2$, 2.42.

The course of the severe burns resulting from skin application of $SeOCl_2$ to rabbits may be summarized as follows:

5 minutes after application: Erythema at site of application.

15 minutes after application: Erythema and swelling around site of application. Red precipitated amorphous selenium at site of application.

1 hour after application: Swelling increased. Area of burn depressed, surrounded by dark ring.

2-10 hours after application: Same as 1 hour. More severe. Entire back swollen.

24 hours after application: No animals receiving 0.01 cc of $SeOCl_2$ survived as long as 24 hours.

In order to show that the toxic effects resulting from skin burns produced by selenium oxychloride are in part attributable to the selenium absorbed, two rabbits were treated with this reagent and killed 3 hours after application. Samples of whole blood and liver tissues were secured and analyses for selenium made (*5*, *6*). It has been shown that, in acute poisoning due to ingestion of seleniferous materials, selenium is largely distributed in the blood and liver (*7*).

TABLE 2.—*Results of determination of selenium in the blood and liver*

Rabbit No.	Weight	$SeOCl_2$ applied	$SeOCl_2$	Whole-blood selenium	Liver selenium
	Grams	*Cc*	*Mg/kilo*	*Ppm*	*Ppm.*
11	2,661	Control	0	0	0
12	2,769	Control	0	0	0
13	1,797	0.01	13.4	.6	2.0
14	1,952	0.03	37.2	2.2	4.8

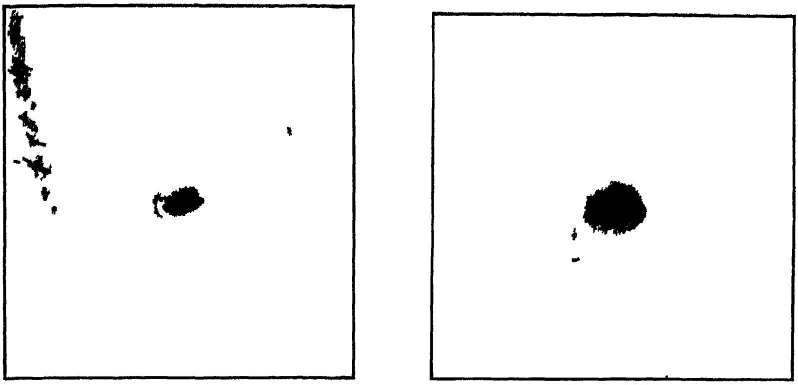

Figure 1.—One hour

Figure 2.—Twenty-four hours

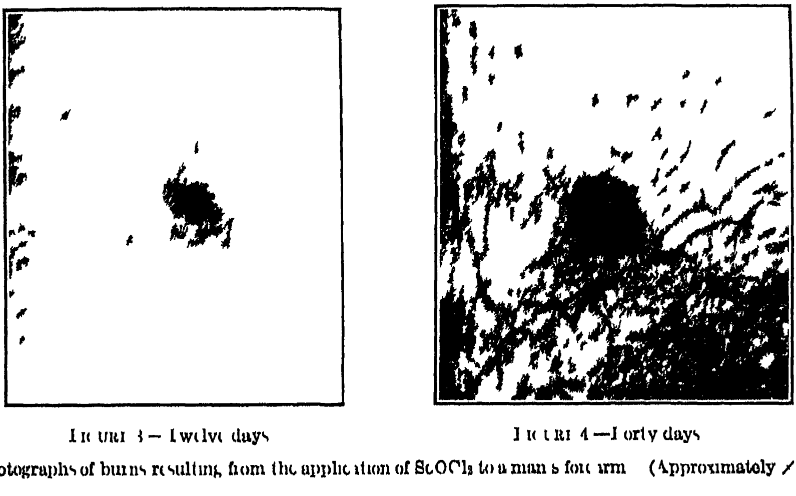

Figure 3.—Twelve days

Figure 4.—Forty days

Photographs of burns resulting from the application of $SeOCl_2$ to a man's forearm (Approximately × 1.)

In table 2 are shown the results of the determination of selenium on whole blood and liver tissue of two rabbits receiving 0.03 and 0.01 cc $SeOCl_2$. These results indicate that the toxic effects of selenium oxychloride are in part due to the selenium introduced into the blood stream through skin absorption.

B. TESTS ON MAN

To the forearm of a man, a minute drop, less than 0.005 cc, of pure $SeOCl_2$ was applied. The results were noted periodically, and photographs (figs. 1 to 4) were made in order to show the course of the burn and method of healing. In an identical manner, $SeOCl_2$ was applied to the forearm of the same individual and immediately rinsed with water, in order to show that prompt removal of the reagent with water will prevent serious burns.

The results of skin application of a minute drop of $SeOCl_2$ to the forearm of a man may be stated as follows:

5 minutes: Tissue destruction. Stinging pain. Area of application ⅛ inch diameter.

15 minutes: Erythema. Swelling in form of wheal, ¼ inch diameter. Center of burn depressed.

1 hour: Wheal ½ inch in diameter. Radiating erythema 1½ inch diameter.

3 hours: Increased swelling of entire area surrounding burn. Painful. Precipitated Se at site of application.

8 hours: Swelling of forearm. Painful. After 8 hours, pain and swelling subsiding.

24 hours: Swelling subsiding. Induration of subcutaneous tissue.

3 days: Swelling subsided. Induration of subcutaneous tissue.

5–10 days: Healing progressed. No secondary infection. Scab formation.

10 days: Healing well progressed. No pain. Depressed erythematous area around scab.

10–20 days: Unchanged.

20 days: Slight secondary infection. Treated with tincture of iodine.

25 days: Healing. Infection cleared.

30 days: Healed. Scab off. Scar tissue at site of application.

Photographs (figs. 1 to 4) taken at intervals of 1 hour, 24 hours, 12 days, and 40 days are shown in order to illustrate the course of the wound.

When a small drop of undiluted $SeOCl_2$ was applied to the skin of the same individual as tested above, and immediately flushed with water, no burn resulted. When using $SeOCl_2$ it seems advisable to have large quantities of water available for immediate use. A general treatment for burns resulting from $SeOCl_2$ should include immediate flushing with water, followed by some weak alkali, as sodium bicarbonate or dilute ammonia water.

SUMMARY AND CONCLUSIONS

1. Selenium oxychloride, $SeOCl_2$, is toxic and extremely vesicant. When 0.01 cc is applied to the skin of rabbits, death occurs in less than 24 hours.

2. The toxic action of selenium oxychloride is in part attributable to the selenium absorbed, as evidenced by the presence of the element in the blood and liver of animals so treated.

3. Selenium oxychloride produces a third degree burn when applied to the skin of man. The burn is painful and slow to heal. Immediate flushing with water will hydrolyze the $SeOCl_2$ rapidly so that no burn results. Treatment with weak alkali, as sodium bicarbonate or dilute ammonia water, is suggested as a general primary treatment.

REFERENCES

(1) Lenher, V.: Selenium oxychloride as a solvent. U. S. Patent No. 1385081, July 19, 1921.
(2) Lenher, V., Smith, G. B., and Town, G. G.: Vapor pressure of selenium oxychloride. J. Phy. Chem., 26: 156 (1922).
(3) Lenher, V.: Some properties of selenium oxychloride. Part I. J. Am. Chem. Soc., 43: 29 (1921). Part II. J. Am. Chem. Soc., 44: 1664 (1922).
(4) Lenher, V.: Preparation of selenium oxychloride. J. Am. Chem. Soc., 42: 2498 (1920).
(5) Robinson, W. O., Dudley, H. C., Williams, K. T., and Byers, H. G.: Determination of selenium and arsenic by distillation. J. Ind. Eng. Chem., Anal. Ed., 6: 274 (1934).
(6) Dudley, H. C., and Byers, H. G.: Determination of selenium in animal matter. J. Ind. Eng. Chem., Anal. Ed., 7: 3 (1935).
(7) Dudley, H. C.: Toxicology of selenium. I. A study of the distribution of selenium in acute and chronic cases of selenium poisoning. Am. J. Hyg., 23: 169 (1936).

DEATHS DURING WEEK ENDED JAN. 1, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Jan. 1, 1938	Corresponding week, 1937
Data from 86 large cities in the United States:		
Total deaths	9,456	10,425
Average for 3 prior years	8,926	
Total deaths, 52 weeks	446,524	448,888
Deaths under 1 year of age	588	635
Average for 3 prior years	537	
Deaths under 1 year of age, 52 weeks	28,485	28,826
Data from industrial insurance companies:		
Policies in force	69,942,678	69,023,395
Number of death claims	12,854	11,790
Death claims per 1,000 policies in force, annual rate	9.6	8.9
Death claims per 1,000 policies, 52 weeks, annual rate	9.7	9.7

MORTALITY SUMMARY FOR LARGE CITIES, 1937

Provisional number of deaths and infant mortality for a group of 86 large cities of the United States for the 52-week period from Jan. 2, 1937, to Jan. 1, 1938, and comparison with provisional and final figures for 1936

[From the weekly Health Index, Bureau of the Census, Department of Commerce]

City	Number of deaths			Infant mortality					
				Number			Rate		
	Provisional		Final 1936[2]	Provisional		Final 1936[2]	Provisional		Final 1936[4]
	1937[1]	1936[1]		1937[1]	1936[1]		1937[3]	1936[3]	
Total (86 cities)	446,524	448,888	454,857	28,485	28,826	30,232	47	50	52
Akron	2,245	2,190	2,220	202	186	195	50	46	48
Albany	1,940	1,932	1,942	135	130	131	54	53	53
Atlanta	4,464	4,812	4,864	392	419	438	64	74	77
White	2,331	--------	2,529	207	--------	--------	52	--------	--------
Negro	2,131	--------	2,335	185	--------	--------	85	--------	--------
Other	2	--------	0	0	--------	--------	0	--------	--------
Baltimore	11,793	11,434	11,516	832	880	893	59	66	67
White	8,959	--------	8,616	525	--------	--------	49	--------	--------
Negro	2,822	--------	2,892	307	--------	--------	93	--------	--------
Other	12	--------	8	0	--------	--------	--------	--------	--------
Birmingham	3,784	3,771	3,827	369	389	402	74	82	85
White	1,905	--------	1,847	200	--------	--------	66	--------	--------
Negro	1,877	--------	1,980	169	--------	--------	86	--------	--------
Other	2	--------	0	0	--------	--------	0	--------	--------
Boston	11,552	11,400	11,504	802	807	822	50	52	52
Bridgeport	1,672	1,676	1,708	105	98	103	41	38	40
Buffalo	7,715	7,594	7,704	524	465	488	53	48	50
Cambridge	1,438	1,422	1,435	114	98	102	44	47	49
Camden	1,720	1,618	1,620	165	151	154	53	49	50
Canton	1,238	1,141	1,162	95	110	110	44	51	53
Chicago	36,217	37,900	38,541	1,820	1,851	1,885	37	39	39
Cincinnati	7,397	7,364	7,452	476	475	485	59	60	61
Cleveland	10,297	10,540	10,620	609	580	610	41	41	43
Columbus	4,487	4,672	4,605	250	285	307	53	58	62
Dallas	3,458	3,611	3,660	336	361	387	59	71	77
White	2,569	--------	2,771	252	--------	--------	56	--------	--------
Negro	889	--------	887	84	--------	--------	87	--------	--------
Other	0	--------	2	0	--------	0	--------	--------	0
Dayton	2,933	2,832	2,861	216	203	208	49	51	55
Denver	4,725	4,536	4,673	356	311	345	59	61	63
Des Moines	1,709	1,796	1,996	133	84	147	41	28	49
Detroit	14,182	14,712	14,816	1,184	1,371	1,420	43	52	53
Duluth	1,215	1,186	1,190	55	56	60	29	32	34
El Paso	1,496	1,403	1,413	275	213	212	105	81	81
Erie	1,582	1,510	1,414	100	78	87	45	34	40
Evansville	1,344	1,608	1,641	120	108	112	69	63	66
Fall River	1,591	1,603	1,612	84	87	87	41	45	45
Flint	1,405	1,406	1,418	176	202	211	49	56	58
Fort Wayne	1,307	1,315	1,325	78	72	77	37	35	38
Fort Worth	1,944	2,152	2,142	163	171	180	55	61	65
White	1,538	--------	1,705	126	--------	--------	50	--------	--------
Negro	406	--------	431	37	--------	--------	86	--------	--------
Other	0	--------	6	0	--------	--------	--------	--------	--------
Grand Rapids	1,803	1,718	1,732	138	116	115	47	45	44
Hartford	2,162	2,183	2,215	115	150	159	46	65	42
Houston	4,334	4,253	4,227	403	345	346	58	67	56
White	3,031	--------	2,905	283	--------	--------	50	--------	--------
Negro	1,302	--------	1,320	120	--------	--------	93	--------	--------
Other	1	--------	2	0	--------	--------	--------	--------	--------
Indianapolis	5,637	5,717	5,616	407	369	376	65	63	63
White	4,759	--------	4,752	334	--------	--------	61	--------	--------
Negro	876	--------	859	73	--------	--------	95	--------	--------
Other	2	--------	5	0	--------	--------	--------	--------	--------
Jersey City	3,614	3,531	3,560	229	227	236	53	34	35
Kansas City, Kans	1,715	1,888	1,871	98	144	139	47	79	63
White	1,344	--------	1,483	78	--------	--------	43	--------	--------
Negro	370	--------	387	20	--------	--------	71	--------	--------
Other	1	--------	1	0	--------	--------	0	--------	--------
Kansas City, Mo	5,336	5,628	5,680	304	310	322	53	53	56

See footnotes at end of table.

Provisional number of deaths and infant mortality for a group of 86 large cities of the United States for the 52-week period from Jan. 2, 1937, to Jan. 1, 1938, and comparison with provisional and final figures for 1936—Continued

City	Number of deaths			Infant mortality					
				Number			Rate		
	Provisional		Final 1936 [2]	Provisional		Final 1936 [2]	Provisional		Final 1936 [4]
	1937 [1]	1936 [1]		1937 [1]	1936 [1]		1937 [3]	1936 [3]	
Knoxville	1,514	1,504	1,507	157	183	190	70	77	86
White	1,196	--------	1,233	129	--------	--------	63	--------	--------
Negro	318	--------	274	28	--------	--------	137	--------	--------
Long Beach	1,693	1,585	1,601	74	81	86	27	33	35
Los Angeles	17,905	16,650	16,774	1,002	977	988	53	56	56
Louisville	4,318	4,093	4,795	161	233	360	30	45	68
White	3,254	--------	3,720	139	--------	--------	29	--------	--------
Negro	1,063	--------	1,075	22	--------	--------	37	--------	--------
Other	1	--------	0	0	--------	--------	0	--------	--------
Lowell	1,469	1,309	1,393	98	86	94	49	72	53
Lynn	1,065	1,052	1,063	37	30	38	27	23	32
Memphis	4,421	4,702	4,708	360	439	454	69	89	93
White	2,319	--------	2,513	202	--------	--------	61	--------	--------
Negro	2,100	--------	2,282	158	--------	--------	77	--------	--------
Other	2	--------	3	0	--------	--------	0	--------	--------
Miami	1,851	1,632	1,649	124	101	118	51	48	53
White	1,356	--------	1,198	83	--------	--------	44	--------	--------
Negro	490	--------	448	41	--------	--------	71	--------	--------
Other	5	--------	3	0	--------	--------	0	--------	--------
Milwaukee	5,570	5,366	5,409	391	421	428	39	44	46
Minneapolis	5,172	5,713	5,823	279	295	339	34	38	44
Nashville	2,079	2,965	2,978	235	254	259	68	67	76
White	1,083	--------	1,869	168	--------	--------	64	--------	--------
Negro	996	--------	1,100	67	--------	--------	79	--------	--------
New Bedford	1,266	1,304	1,307	77	101	102	45	58	58
New Haven	2,081	2,116	2,118	69	62	102	33	29	34
New Orleans	8,005	8,719	8,811	749	825	834	79	92	93
White	4,892	--------	5,237	379	--------	--------	66	--------	--------
Negro	3,113	--------	3,565	370	--------	--------	97	--------	--------
Other	0	--------	9	0	--------	--------	0	--------	--------
New York	77,135	77,022	77,687	4,449	4,447	4,500	44	45	45
Bronx Borough	12,011	11,938	12,048	645	626	625	41	41	42
Brooklyn Borough	26,004	25,900	26,067	1,674	1,648	1,670	42	42	42
Manhattan Borough	27,730	27,946	28,303	1,597	1,669	1,700	50	53	53
Queens Borough	8,975	8,863	8,834	421	421	421	38	40	41
Richmond Borough	2,415	2,375	2,435	112	83	84	46	36	36
Newark, N. J.	5,038	5,027	5,106	267	306	316	35	42	44
Oakland	3,636	3,570	3,611	221	183	186	46	44	44
Oklahoma City	2,308	2,428	2,434	192	167	238	50	44	64
Omaha	2,925	3,132	3,068	172	222	226	44	52	53
Paterson	1,743	1,739	1,704	91	110	121	35	42	46
Peoria	1,568	1,577	1,593	179	141	146	66	59	61
Philadelphia	25,186	24,895	25,105	1,350	1,387	1,418	45	47	48
Pittsburgh	9,358	8,953	9,035	700	617	680	52	50	51
Portland, Oreg.	4,305	4,192	4,224	174	163	173	36	37	39
Providence	3,456	3,255	3,284	256	206	210	47	39	40
Richmond	2,824	3,216	3,237	222	231	244	66	75	76
White	1,688	--------	1,882	106	--------	--------	47	--------	--------
Negro	1,136	--------	1,352	116	--------	--------	105	--------	--------
Other	0	--------	3	0	--------	--------	0	--------	--------
Rochester	3,781	3,959	3,997	166	195	197	32	39	40
St. Louis	11,601	12,286	12,826	463	419	641	34	33	50
St. Paul	2,982	3,175	3,307	136	147	207	25	29	41
Salt Lake City	1,894	1,764	1,801	132	142	149	36	41	43
San Antonio	3,578	3,712	3,728	604	620	613	102	108	105
White	3,285	--------	3,412	578	--------	--------	102	--------	--------
Negro	290	--------	311	26	--------	--------	114	--------	--------
Other	3	--------	5	0	--------	--------	--------	--------	--------
San Diego	2,556	2,431	2,431	112	138	139	32	45	44
San Francisco	9,244	8,969	9,028	246	282	302	31	39	41
Schenectady	1,054	1,023	1,042	66	62	66	47	44	48
Seattle	4,801	4,877	4,919	207	169	174	40	34	34
Somerville	895	902	965	46	44	46	38	37	36
South Bend	925	896	919	65	61	67	39	40	44
Spokane	1,705	1,652	1,663	81	121	127	34	56	57
Springfield, Mass.	1,875	1,844	1,855	102	126	138	39	53	55
Syracuse	2,675	2,438	2,458	157	159	164	42	44	46
Tacoma	1,567	1,585	1,595	58	71	74	29	39	40

See footnotes at end of table.

Provisional number of deaths and infant mortality for a group of 86 large cities of the United States for the 52-week period from Jan. 2, 1937, to Jan. 1, 1938, and comparison with provisional and final figures for 1936—Continued

City	Number of deaths			Infant mortality					
				Number			Rate		
	Provisional		Final 1936 [2]	Provisional		Final 1936 [2]	Provisional		Final 1936 [4]
	1937 [1]	1936 [1]		1937 [1]	1936 [1]		1937 [3]	1936 [3]	
Tampa	1,269	1,293	1,316	94	79	84	56	49	51
White	918	--------	968	71	--------	--------	52	--------	--------
Negro	343	--------	348	23	--------	--------	73	--------	--------
Other	8	--------	0	0	--------	--------	0	--------	--------
Toledo	3,828	3,818	3,840	261	215	223	52	46	48
Trenton	1,885	1,800	1,755	115	131	129	46	54	54
Utica	1,394	1,396	1,427	93	86	92	50	45	50
Washington, D. C	8,704	9,031	9,094	746	834	847	61	71	72
White	5,418	--------	5,610	342	--------	--------	41	--------	--------
Negro	3,241	--------	3,469	403	--------	--------	102	--------	--------
Other	15	--------	15	1	--------	--------	25	--------	--------
Waterbury	941	879	1,059	74	73	94	37	53	51
Wilmington, Del	1,590	1,485	1,609	122	108	122	49	51	57
Worcester	2,705	2,635	2,653	155	167	168	45	49	51
Yonkers	1,241	1,169	1,222	71	80	85	43	47	50
Youngstown	1,882	1,889	1,883	158	127	139	49	42	48

[1] Based upon telegraphic reports received each week from city health officers.

[2] Calendar year; tabulation of transcripts received from State registrars' offices.

[3] The provisional infant mortality rate is computed from deaths under 1 year as reported each week, per 1,000 estimated live births for 1936 and 1937, respectively.

[4] Calendar year; the final infant mortality rate is the number of deaths under 1 year of age per 1,000 live births.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred while leaders (-----) indicate that cases or deaths may have occurred, although none was reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 8, 1938, and Jan. 9, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Jan. 8, 1938	Week ended Jan. 9, 1937	Week ended Jan 8, 1938	Week ended Jan 9, 1937	Week ended Jan. 8, 1938	Week ended Jan. 9, 1937	Week ended Jan 8, 1938	Week ended Jan. 9, 1937
New England States:								
Maine	2	1	13	41	74	99	0	0
New Hampshire	------	------	------	------	42	24	0	0
Vermont	1	------	------	------	237	10	0	0
Massachusetts	5	7	------	------	115	930	2	3
Rhode Island	------	1	------	------	------	146	0	1
Connecticut	7	4	14	67	17	170	2	8
Middle Atlantic States:								
New York	24	62	[1] 23	[1] 1,783	204	375	5	9
New Jersey	17	22	22	118	1,028	437	6	5
Pennsylvania	87	50	------	------	2,633	83	1	5
East North Central States:								
Ohio	23	28	7	10	594	31	5	3
Indiana	38	16	22	346	200	10	1	2
Illinois	48	30	22	390	2,627	19	3	9
Michigan [2]	19	11	------	66	320	19	2	2
Wisconsin	4	7	28	655	390	27	1	8
West North Central States:								
Minnesota	5	12	1	25	7	38	1	2
Iowa	4	4	2	2,854	51	6	4	8
Missouri	42	11	118	621	1,212	2	0	3
North Dakota	2	2	5	66	31	------	0	0
South Dakota	12	------	1	42	------	5	0	0
Nebraska	2	------	10	51	8	1	2	8
Kansas	12	------	10	876	101	8	5	1
South Atlantic States:								
Delaware	------	4	------	8	6	184	0	0
Maryland [2] [3]	19	18	15	61	11	230	3	5
District of Columbia	6	17	2	15	14	16	1	5
Virginia	19	48	------	------	199	112	5	8
West Virginia	18	12	66	76	361	28	0	2
North Carolina [4]	43	45	24	34	831	43	0	2
South Carolina [4]	2	18	588	720	168	16	1	2
Georgia [4]	17	15	------	------	246	------	0	3
Florida [4]	18	13	4	7	132	3	4	7

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 8, 1938, and Jan. 9, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Jan. 8, 1938	Week ended Jan. 9, 1937	Week ended Jan. 8, 1938	Week ended Jan. 9, 1937	Week ended Jan. 8, 1938	Week ended Jan. 9, 1937	Week ended Jan. 8, 1938	Week ended Jan 9, 1937
East South Central States:								
Kentucky	13	14	69		262	199	7	19
Tennessee	17	13	147	318	361	9	6	4
Alabama [4]	12	27	377	250	77	2	8	3
Mississippi [2]	11	5					3	0
West South Central States:								
Arkansas	8	2	92	283	49	2	1	2
Louisiana	13	13	42	47	3	7	5	0
Oklahoma [5]	19	8	87	140	7	14	1	0
Texas [4]	66	86	427	756	51	160	1	2
Mountain States:								
Montana	4	1		637	8	2	0	4
Idaho			3	39	9	102	0	0
Wyoming	1	7			4	1	0	0
Colorado	12	5		77	174	6	1	1
New Mexico	4	5	2	22	57	10	1	1
Arizona	9	5	106	283	6	78	2	5
Utah [2]	12				48	126	2	0
Pacific States:								
Washington	5	2		7	17	32	0	1
Oregon	2	1	56	171	23	8	1	0
California	45	30	78	183	43	126	2	10
Total	694	677	2,423	12,145	13,148	3,956	95	143

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Jan. 8, 1938	Week ended Jan 9, 1937	Week ended Jan 8, 1938	Week ended Jan. 9, 1937	Week ended Jan. 8, 1938	Week ended Jan. 9, 1937	Week ended Jan. 8, 1938	Week ended Jan. 9, 1937	Week ended Jan. 8, 1938
New England States:									
Maine	0	0	26	22	0	0	1	2	131
New Hampshire	0	0	20	4	0	0	0	0	6
Vermont	0	0	15	9	0	0	0	1	50
Massachusetts	0	0	240	228	0	0	2	2	180
Rhode Island	0	0	26	24	0	0	0	0	36
Connecticut	0	0	78	68	0	0	2	1	49
Middle Atlantic States:									
New York	1	2	549	687	0	3	4	5	349
New Jersey	0	0	117	197	0	0	1	4	215
Pennsylvania	0	0	248	508	0	0	6	11	206
East North Central States:									
Ohio	2	0	318	234	6	4	1	12	42
Indiana	0	0	190	174	34	15	1	2	23
Illinois	1	8	658	473	32	12	1	9	104
Michigan [2]	0	2	331	421	0	0	2	1	99
Wisconsin	0	1	181	274	1	11	2	0	121
West North Central States:									
Minnesota	1	0	132	131	61	13	0	0	66
Iowa	0	0	193	100	55	33	0	1	32
Missouri	0	0	224	126	38	47	2	2	48
North Dakota	0	0	26	30	8	25	0	0	25
South Dakota	0	0	31	54	5	2	0	1	19
Nebraska	1	0	38	37	1	8	2	2	16
Kansas	0	0	201	167	19	13	2	3	104
South Atlantic States:									
Delaware	0	0	21	19	0	0	0	0	8
Maryland [2] [3]	0	0	54	106	0	0	4	2	55
District of Columbia	0	1	20	18	0	0	0	0	17
Virginia	0	0	34	58	0	0	2	1	118
West Virginia	0	2	75	60	1	0	7	2	72
North Carolina [4]	2	0	58	52	0	0	7	4	328
South Carolina [4]	0	0	3	10	0	0	4	4	65
Georgia [4]	1	1	18	7	0	0	3	3	9
Florida [4]	0	0	9	14	5	0	2	1	2

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 8, 1938, and Jan. 9, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Jan. 8, 1938	Week ended Jan. 9, 1937	Week ended Jan. 8, 1938	Week ended Jan. 9, 1937	Week ended Jan. 8, 1938	Week ended Jan. 9, 1937	Week ended Jan. 8, 1938	Week ended Jan. 9, 1937	Week ended Jan. 8, 1938
East South Central States:									
Kentucky	0	0	72	63	64	0	1	8	90
Tennessee	1	2	50	50	7	0	1	3	29
Alabama [4]	0	0	14	22	2	0	3	4	22
Mississippi [2]	0	0	13	11	1	1	0	1	-------
West South Central States:									
Arkansas	1	1	13	18	9	0	1	2	22
Louisiana	1	1	10	29	0	1	4	11	-------
Oklahoma [5]	2	0	101	17	9	0	4	2	14
Texas [4]	1	1	95	79	0	4	22	9	140
Mountain States:									
Montana	0	0	37	35	13	26	1	0	67
Idaho	1	0	25	28	12	7	3	0	32
Wyoming	0	0	28	18	5	4	0	0	14
Colorado	0	0	33	58	12	3	1	0	10
New Mexico	0	0	16	35	0	0	3	9	19
Arizona	1	0	10	15	0	0	4	1	19
Utah [2]	0	0	77	8	0	0	0	0	20
Pacific States:									
Washington	0	1	48	50	23	5	1	3	134
Oregon	1	0	41	34	11	27	3	3	10
California	2	3	207	285	25	12	13	5	390
Total	20	21	5,024	5,167	459	276	123	137	3,627

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[1] New York City only.
[2] Week ended earlier than Saturday.
[3] Rocky Mountain spotted fever, week ended Jan. 8, 1938, Maryland, 1 case.
[4] Typhus fever, week ended Jan. 8, 1938, 26 cases, as follows: North Carolina, 4; South Carolina, 3; Georgia, 12; Florida, 1; Alabama, 2; Texas, 4.
[5] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
October 1937										
Alaska	-------	-------	24	-------	-------	-------	0	-------	0	0
November 1937										
Alaska	-------	-------	4	-------	-------	-------	0	-------	0	0
Mississippi	8	97	3,824	2,110	146	177	13	80	8	20
Wisconsin	-------	21	199	-------	298	-------	13	851	14	4
December 1937										
Connecticut	4	35	14	1	29	-------	1	316	0	3
New Jersey	6	64	63	1	2,824	-------	1	415	0	9
North Carolina	10	170	46	24	1,904	30	0	241	1	17
West Virginia	14	57	127	-------	503	-------	2	268	1	6

Summary of monthly reports from States—Continued

	Cases
October 1937	
Alaska:	
Chicken pox	54
Mumps	30
Whooping cough	52
November 1937	
Chicken pox:	
Alaska	16
Mississippi	428
Wisconsin	2,098
Dengue:	
Mississippi	13
Dysentery:	
Mississippi (amoebic)	71
Mississippi (bacillary)	260
Hookworm disease:	
Mississippi	482
Impetigo contagiosa:	
Alaska	3
Mumps:	
Alaska	39
Mississippi	105
Wisconsin	430
Ophthalmia neonatorum:	
Mississippi	5
Puerperal septicemia:	
Mississippi	20
Rabies in animals:	
Mississippi	13
Rabies in man:	
Mississippi	4
Septic sore throat:	
Wisconsin	20
Trachoma:	
Mississippi	3
Tularaemia:	
Mississippi	3
Wisconsin	1
November 1937—Continued	
Undulant fever:	
Mississippi	1
Wisconsin	8
Whooping cough:	
Alaska	97
Mississippi	425
Wisconsin	821
December 1937	
Chicken pox:	
Connecticut	701
New Jersey	2,224
North Carolina	1,013
West Virginia	165
Dysentery:	
Connecticut (amoebic)	1
Connecticut (bacillary)	25
New Jersey (amoebic)	1
New Jersey (bacillary)	1
Encephalitis, epidemic or lethargic:	
Connecticut	1
New Jersey	4
German measles:	
Connecticut	15
New Jersey	54
North Carolina	35
Lead poisoning:	
Connecticut	2
Mumps:	
Connecticut	621
New Jersey	426
West Virginia	4
December 1937—Continued	
Ophthalmia neonatorum:	
Connecticut	2
New Jersey	15
Paratyphoid fever:	
Connecticut	2
New Jersey	1
Rabies in animals:	
Connecticut	8
New Jersey	8
Rocky Mountain spotted fever:	
North Carolina	1
Septic sore throat:	
Connecticut	20
New Jersey	11
North Carolina	15
Tetanus:	
New Jersey	2
Trichinosis:	
New Jersey	1
Tularaemia:	
New Jersey	3
North Carolina	1
West Virginia	1
Typhus fever:	
New Jersey	1
North Carolina	8
Undulant fever:	
Connecticut	7
New Jersey	4
West Virginia	1
Whooping cough:	
Connecticut	180
New Jersey	589
North Carolina	889
West Virginia	173

PLAGUE INFECTION IN FRESNO COUNTY, CALIF.

Under date of December 28, 1937, Dr. W. M. Dickie, director of public health of California, reported that plague infection had been proved, by animal inoculation and cultural tests, in 29 fleas taken from 5 *beecheyi* squirrels collected on November 3 in the Shaver Lake area, Fresno County, Calif.

WEEKLY REPORTS FROM CITIES

City reports for week ended Jan. 1, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	268	1, 200	150	1, 447	978	1, 572	16	384	26	981	--------
Current week [1]	162	286	79	2, 539	849	1, 192	43	350	32	742	--------
Maine:											
Portland	1	------	0	0	8	2	0	1	0	10	36
New Hampshire:											
Concord	0	------	0	9	1	0	0	1	0	2	17
Manchester	0	------	1	0	0	0	0	0	0	0	19
Nashua	0	------	--------	0	-------	0	0	-------	0	0	4
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	4
Burlington	0	------	0	0	0	0	0	0	0	7	9
Rutland	0	------	0	0	0	1	0	0	0	2	4
Massachusetts:											
Boston	1	------	0	51	20	81	0	6	2	6	208
Fall River	1	------	0	0	5	1	0	1	0	16	38
Springfield	0	------	1	1	4	14	0	2	0	3	48
Worcester	0	------	0	1	7	4	0	3	0	5	65
Rhode Island:											
Pawtucket	0	------	0	0	0	3	0	0	0	0	17
Providence	0	------	0	0	7	15	0	1	0	18	71
Connecticut:											
Bridgeport	0	2	1	1	4	6	0	1	0	0	40
Hartford	0	------	0	1	5	17	0	1	0	2	41
New Haven	0	------	0	0	1	5	0	0	0	4	42
New York:											
Buffalo	0	------	1	3	19	13	0	6	0	14	171
New York	39	17	8	46	125	163	0	72	7	115	1, 465
Rochester	0	------	0	4	11	2	0	4	0	4	88
Syracuse	0	------	0	0	5	2	1	0	0	5	50
New Jersey:											
Camden	2	2	2	22	4	2	0	2	0	1	45
Newark	1	5	0	4	8	12	0	8	0	21	100
Trenton	0	1	1	129	4	5	0	3	1	5	52
Pennsylvania:											
Philadelphia	3	10	8	121	36	83	0	17	5	23	482
Pittsburgh	5	------	3	301	35	50	0	6	1	20	198
Reading	0	------	0	4	2	7	0	1	0	0	18
Scranton	1	------	--------	23	-------	3	0	-------	0	0	--------
Ohio:											
Cincinnati	1	------	3	11	15	14	0	5	0	9	157
Cleveland	1	18	1	99	16	36	0	13	0	27	203
Columbus	1	2	2	6	7	6	0	4	0	6	91
Toledo	0	1	1	53	6	5	0	4	0	0	80
Indiana:											
Anderson	0	------	0	0	2	3	0	1	0	1	17
Fort Wayne	2	------	0	0	8	5	0	3	0	0	23
Indianapolis	9	------	2	7	16	13	0	2	0	1	116
Muncie	0	------	1	12	3	3	2	1	0	0	14
South Bend	0	------	0	0	3	2	0	1	0	4	16
Terre Haute	0	------	0	0	0	1	0	0	0	0	27
Illinois:											
Alton	0	------	0	5	8	11	0	1	0	0	10
Chicago	7	14	2	471	55	175	1	38	0	23	878
Elgin	0	------	0	0	3	7	0	0	0	1	18
Moline	0	------	0	29	2	10	0	0	0	0	6
Springfield	0	------	0	2	0	5	1	1	0	0	19
Michigan:											
Detroit	9	2	1	196	27	100	0	16	0	44	288
Flint	2	------	0	0	6	25	0	0	0	6	31
Grand Rapids	0	------	0	5	6	22	0	0	0	7	35
Wisconsin:											
Kenosha	0	------	0	0	0	5	0	0	0	2	8
Madison	0	------	0	2	1	8	0	0	0	2	10
Milwaukee	3	------	0	190	16	20	0	1	0	23	148
Racine	0	------	0	6	1	5	0	0	0	4	12
Superior	0	------	0	0	0	4	0	0	0	0	13

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[1] Figures for Little Rock estimated; report not received.

City reports for week ended Jan. 1, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	1	0	3	7	0	2	1	8	27
Minneapolis	1	------	0	3	6	18	0	2	0	0	102
St. Paul	0	------	0	2	10	5	25	4	0	1	70
Iowa:											
Cedar Rapids	0	------	------	0	------	1	0	------	0	1	------
Davenport	0	------	------	18	------	1	0	------	0	0	------
Des Moines	0	------	------	0	------	24	0	------	0	0	33
Sioux City	0	------	------	0	------	3	0	------	0	2	------
Missouri:											
Kansas City	1	2	1	14	10	17	0	8	1	0	120
St. Joseph	2	------	0	0	1	1	0	0	0	0	21
St. Louis	9	------	2	468	33	41	6	8	2	2	306
North Dakota:											
Fargo	0	------	0	0	0	1	0	0	0	0	9
Grand Forks	1	------	------	0	------	6	0	------	0	0	------
Minot	0	------	0	0	0	1	0	0	0	4	5
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	1	------
Nebraska:											
Omaha	0	------	0	0	5	0	0	2	0	0	43
Kansas:											
Lawrence	0	------	0	0	1	1	0	0	0	1	4
Topeka	0	------	1	3	2	4	0	0	0	12	30
Wichita	0	2	0	2	6	4	0	0	0	2	25
Delaware:											
Wilmington	0	------	0	0	2	5	0	1	0	5	34
Maryland:											
Baltimore	1	8	1	2	26	19	0	7	2	38	265
Cumberland	0	------	0	0	0	0	0	0	0	0	17
Frederick	0	------	0	0	0	0	0	0	0	0	6
District of Columbia:											
Washington	5	5	3	8	20	15	0	12	1	8	195
Virginia:											
Lynchburg	1	------	0	0	4	2	0	1	1	3	18
Richmond	0	------	6	1	9	6	0	1	0	2	82
Roanoke	2	------	0	1	1	1	0	0	1	2	23
West Virginia:											
Charleston	0	3	1	13	7	1	0	1	0	0	26
Huntington	0	------	------	26	------	0	0	------	0	0	------
Wheeling	0	------	0	3	4	2	0	1	------	4	28
North Carolina:											
Gastonia	0	------	------	0	1	0	0	------	0	0	------
Raleigh	0	------	0	0	4	0	0	0	0	41	34
Wilmington	0	------	0	0	5	0	0	1	0	9	12
Winston-Salem	0	------	0	0	5	1	0	2	1	10	17
South Carolina:											
Charleston	1	41	1	34	4	2	0	1	0	1	24
Florence	0	------	0	0	0	0	0	0	0	0	9
Greenville	0	------	0	0	2	1	0	0	0	12	3
Georgia:											
Atlanta	1	21	4	81	15	9	0	4	0	17	106
Brunswick	0	------	0	0	0	0	0	0	0	0	5
Savannah	0	74	3	0	3	1	0	1	0	0	34
Florida:											
Miami	1	2	0	27	1	0	0	4	0	4	40
Tampa	4	3	3	1	3	1	0	1	0	1	83
Kentucky:											
Covington	0	1	0	0	3	0	0	0	0	1	14
Lexington	0	2	1	0	3	0	0	2	0	0	24
Louisville	3	2	1	52	16	35	0	3	0	8	96
Tennessee:											
Knoxville	0	4	3	4	6	0	0	0	1	1	31
Memphis	2	4	0	101	8	6	0	3	0	10	84
Nashville	3	------	1	0	9	0	0	1	0	1	64
Alabama:											
Birmingham	1	16	0	8	9	2	0	4	0	0	79
Mobile	0	------	1	0	1	0	0	1	0	0	38
Montgomery	2	------	------	0	------	0	0	------	0	0	------

City reports for week ended Jan. 1, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Arkansas:											
Fort Smith	0	------	------	0	------	2	0	------	0	0	------
Little Rock	------	------	------	------	------	------	------	------	------	------	------
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	0	2
New Orleans	4	17	4	0	30	5	0	10	2	7	191
Shreveport	1	------	0	0	4	2	0	1	0	0	30
Oklahoma:											
Muskogee	0	------	------	0	------	2	0	------	0	0	------
Oklahoma City	1	------	1	0	5	6	0	1	0	0	48
Tulsa	1	------	------	0	------	1	3	------	0	6	------
Texas:											
Dallas	3	2	2	0	12	3	0	0	0	2	78
Fort Worth	5	------	3	0	6	9	0	0	0	0	36
Galveston	0	------	0	0	2	1	0	0	0	0	15
Houston	3	------	2	0	13	5	0	4	0	0	82
San Antonio	1	------	1	0	11	0	0	8	1	0	78
Montana:											
Billings	0	------	0	0	1	2	0	0	0	0	6
Great Falls	0	------	0	0	1	0	2	0	0	8	7
Helena	0	------	0	0	0	0	0	0	0	8	7
Missoula	0	------	0	0	0	0	0	0	2	0	10
Idaho:											
Boise	0	------	0	0	0	0	6	0	0	0	5
Colorado:											
Colorado Springs	0	------	0	0	5	2	0	0	0	1	9
Denver	6	------	0	75	12	20	0	2	0	0	95
Pueblo	0	------	1	0	0	0	0	0	0	0	8
New Mexico:											
Albuquerque	0	------	0	48	2	1	0	5	0	8	10
Utah:											
Salt Lake City	0	------	0	1	2	9	0	2	0	4	30
Washington:											
Seattle	2	------	0	1	9	4	0	3	0	29	111
Spokane	0	------	0	0	5	3	0	0	0	10	39
Tacoma	0	------	0	0	1	8	1	2	0	8	34
Oregon:											
Portland	0	------	0	2	2	7	0	3	0	2	75
Salem	0	------	------	0	------	1	0	------	0	0	------
California:											
Los Angeles	17	13	3	6	28	29	0	18	0	17	384
Sacramento	2	------	0	0	1	0	0	0	1	25	28
San Francisco	1	------	1	1	14	6	0	9	0	22	182

State and city	Meningococcus meningitis		Poliomyelitis cases	State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Maine:				Missouri:			
Portland	1	0	0	St. Joseph	0	1	0
Massachusetts:				Maryland:			
Boston	0	1	0	Baltimore	3	2	0
New York:				Florida:			
Buffalo	4	0	0	Miami	1	0	0
New York	4	1	0	Kentucky:			
Pennsylvania:				Louisville	0	0	1
Philadelphia	2	0	0	Tennessee:			
Ohio:				Memphis	1	0	0
Cincinnati	6	1	0	Alabama:			
Cleveland	5	1	0	Birmingham	2	1	0
Illinois:				Louisiana:			
Chicago	2	1	1	New Orleans	2	1	0
Michigan:				Shreveport	0	1	0
Detroit	0	0	1	California:			
Minnesota:				Los Angeles	0	0	1
Minneapolis	0	0	1	Sacramento	0	1	1
Iowa:							
Des Moines	2	0	0				

Encephalitis, epidemic or lethargic.—Cases: Providence, 1; New York, 1; Syracuse, 1; Baltimore, 1; San Antonio, 1.

Pellagra.—Cases: Atlanta, 8; Savannah, 8; Birmingham, 1; Houston, 1.

Typhus fever.—Cases: Savannah, 2; Montgomery, 1.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—2 weeks ended December 4, 1937.—During the 2 weeks ended December 4, 1937, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis				3	2	1		1	1	8
Chicken pox		9	2	304	533	210	109	39	104	1,370
Diphtheria		8	7	188	28	2	3	5		241
Erysipelas				12	3		2	3	1	21
Influenza		15		7	10				57	89
Lethargic encephalitis				2	1					3
Measles		24	10	392	342	34	107	73	194	1,176
Mumps		5			159	20		4	28	216
Paratyphoid fever		6			1					7
Pneumonia		7			58		7		19	91
Poliomyelitis			1	2	5	4	15	3	3	33
Scarlet fever		35	5	312	267	54	110	52	60	895
Tuberculosis	2	11	16	90	115	51	2		28	315
Typhoid fever		1	4	116	15	7	8	1	5	157
Undulant fever				2	3			1		6
Whooping cough		7		549	103	70	43	4	65	841

CUBA

Habana—Communicable diseases—4 weeks ended December 18, 1937.—During the 4 weeks ended December 18, 1937, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	4		Scarlet fever	1	
Leprosy		3	Tuberculosis	7	
Malaria	[1] 33		Typhoid fever	[1] 14	1
Poliomyelitis	[1] 3				

---

[1] Includes imported cases.

GREAT BRITAIN

England and Wales—Infectious diseases—13 weeks ended October 2, 1937.—During the 13 weeks ended October 2, 1937, certain infectious diseases were reported in England and Wales as follows:

Disease	Cases	Disease	Cases
Diphtheria	13,289	Puerperal pyrexia	1,810
Ophthalmia neonatorum	1,407	Scarlet fever	21,167
Pneumonia	5,735	Typhoid fever	588
Puerperal fever	496		

England and Wales—Vital statistics—Third quarter 1937.—During the quarter ended September 30, 1937, 158,647 live births and 100,295 deaths were registered in England and Wales. The following statistics are taken from the Quarterly Return of Births, Deaths, and Marriages, issued by the Registrar General of England and Wales, and are provisional:

Birth and death rates in England and Wales, quarter ended September 30, 1937

Annual rates per 1,000 population:	
Live births	15.4
Stillbirths	.58
Deaths, all causes	9.7
Deaths under 1 year of age	[1]43
Deaths from:	
Diarrhea and enteritis (under 2 years of age)	[1]5.6
Diphtheria	.06
Annual rates per 1,000 population—Continued.	
Deaths from—Continued.	
Influenza	.03
Measles	.01
Scarlet fever	.01
Typhoid fever and paratyphoid fever	.0
Violence	.54
Whooping cough	.03

[1] Per 1,000 live births.

YUGOSLAVIA

Communicable diseases—4 weeks ended December 5, 1937.—During the 4 weeks ended December 5, 1937, certain communicable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	28	6	Paratyphoid fever	24	2
Cerebrospinal meningitis	9	5	Poliomyelitis	3	
Diphtheria and croup	1,265	76	Scarlet fever	383	2
Dysentery	68	5	Sepsis	7	5
Erysipelas	199	2	Tetanus	15	11
Leprosy	1		Typhoid fever	688	61
Lethargic encephalitis	2		Typhus fever	6	
Measles	67	1			

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for December 31, 1937, pages 1952-1965. Similar cumulative tables will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

China.—During the week ended January 1, 1938, 1 case of cholera was reported in Hong Kong and 3 cases of cholera were reported in Shanghai.

French Indochina.—During the week ended January 1, 1938, cholera was reported in French Indochina as follows: Annam Province, 5 cases; Tonkin Province, 15 cases.

Plague

Brazil.—During the month of November 1937, 5 cases of plague with 3 deaths were reported in Pernambuco, Brazil, making a total of 22 cases of plague with 9 deaths reported in Pernambuco since January 1, 1937, and a total of 34 cases of plague with 15 deaths in all of Brazil for the same period.

Egypt—Asyut Province—Deirout District.—During the week ended January 1, 1938, 1 case of plague was reported in Deirout District, Asyut Province, Egypt.

Hawaii Territory—Island of Hawaii—Hamakua District—Hamakua Mill Sector.—A rat found on December 30, 1937, in Hamakua Mill Sector, Hamakua District, Island of Hawaii, Hawaii Territory, has been proved positive for plague.

Island of Maui—Wailuku District—Puunene.—One death from plague at Puunene, Island of Maui, was reported on January 13, 1938. The death occurred on January 5, in a Filipino laborer, who lived in a sugar company camp 3 miles from the port of Kahului, where sanitary conditions are reported good and the rat population is said to be low. No information was available regarding localities visited prior to illness.

India—Bassein.—During the week ended January 1, 1938, 1 case of plague was reported in Bassein, India.

United States—California.—A report of plague infection in California appears on page 105 of this issue of PUBLIC HEALTH REPORTS.

Smallpox

Siam—Uttradhani Province.—During the week ended January 1, 1938, 35 cases of smallpox were reported in Uttradhani Province, Siam.

Typhus Fever

Netherlands—Rotterdam.—During the week ended December 18, 1937, 1 suspected case of typhus fever was reported in Rotterdam, Netherlands.

Yellow Fever

Colombia—Santander Department—Velez.—During the week ended December 25, 1937, 1 death from yellow fever was reported in Velez, Santander Department, Colombia.

Gold Coast.—During the period December 23–30, 1937, yellow fever was reported in Gold Coast as follows: Agormanya, 1 case; Ho, 2 cases; Keta, 1 case; Yeji, 1 suspected case.

Sudan (French).—During the week ended January 1, 1938, 1 case of yellow fever was reported in French Sudan, locality not specified.

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The Pollution Problem in the Ohio River Drainage Basin
Report on Market-Milk Supplies of Urban Communities

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UNITED STATES PUBLIC HEALTH SERVICE

Thomas Parran, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg. Gen. Robert Olesen, *Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PUBLIC HEALTH REPORTS

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PATHOLOGIC HISTOLOGY IN MICE PRODUCED BY INTRAVENOUS INOCULATION WITH THE TOXIN OF *CLOSTRIDIUM SORDELLII (BIFERMENTANS)*

By R. D. Lillie, *Surgeon, United States Public Health Service, Division of Pathology, National Institute of Health*

Histologic studies of the lesions in experimental animals have not previously been reported. The reports of Sordelli (*1*), of Hall and Scott (*2*), of Hall, Rymer, and Jungherr (*3*), of Vawter (*4*), and of Meleney, Humphreys, and Carp (*5*, *6*), agree in describing great swelling and slightly hemorrhagic edema of the subcutaneous tissues at the site of inoculation, usually with little or no emphysema. These findings were quite consistent in guinea pigs, cats, dogs, rabbits, mice, chickens, pigeons, and rats. The viscera were often normal or showed pulmonary congestion, pleural exudates, edema of pleura and peritoneum (Hall and Scott). Sordelli noted inconstantly peritoneal exudates, autodigestion of the stomach, intense congestion of jejunum and adrenals, and white friable muscles in rabbits and guinea pigs. After intravenous inoculation of rabbits, effusions in the body cavities were noted by Meleney, Humphreys, and Carp (*6*), while Hall, Rymer, and Jungherr described in rabbits pale edematous or pneumonic lungs, dilated engorged heart chambers, and 5 to 10 cc of serous fluid in the pleurae. Hall (*7*) has also noted hemorrhagic congestion of the renal cortex and contraction of the bladder in guinea pigs.

A few human cases have been studied. Sordelli's original report simply notes that the organism was recovered alone or in mixed culture from cases of gangrene. Meleney, Humphreys, and Carp (*6*) described a case fatal on the 34th postoperative day. The wound surfaces were covered with thick pus, the adjacent abdominal wall showed great thickening, board-like induration, and edema with thrombosis of subcutaneous veins, small ecchymoses, and no suppuration. Microscopically there were edema of fat and muscle, dense mononuclear and polynuclear infiltration, little destruction of fat, atrophy of muscle fibers, and numerous Gram-positive bacilli. Elsewhere there were noted 250 cc of serous peritoneal exudate containing a few fibrin flakes, congestion of liver and spleen, and edema of the lungs. Microscopically they noted centrolobular degeneration and dispersed bacilli in the liver and some destruction of tubular epithelium in the kidney.

Hall and Gray (*8*) recorded a case of peritonitis resulting apparently from intestinal infection with *Cl. sordellii* occurring in a case of decompensated hypertensive heart disease. The sigmoid showed two red areas, one externally covered by fibrine, which microscopically showed serofibrinopurulent mucosal necrosis and ulceration, seropurulent exudate with many large spore-bearing Gram-positive bacilli in the outer layers, vacuolation or destruction of muscle fibers, and a necrosing purulent arteritis in the serosa. The peritoneum contained a liter of turbid yellowish fluid. Centrolobular congestion of the liver with post-mortem necrosis and vacuolization of adjacent cells was described, but appears not improbably assignable to the chronic cardiac failure indicated clinically. Part of the upper lobe of the right lung was deep red and exuded fluid on section. Histologically there was a serous exudate containing a few leucocytes, and vessel walls were thickened.

Material for this study was derived from Bengtson and Stewart's current studies in the standardization of the antitoxins for the pathogenic anaerobes. Animals were inoculated intravenously with toxin, and only those mice were used for histologic study which were killed or seen dying. Autopsies were performed within 10 minutes of death, and all viscera fixed en bloc in Orth's bichromate formol, together with a piece of the spinal column.

Heart.—The heart cavities, particularly the atria, are often dilated and engorged with blood. The heart muscle fibers are usually cloudy in appearance and often studded with fine eosinophilic granules in the sarcoplasm. The cross striations are often clearly defined, often partially obscured, sometime totally so. Cloudiness, granularity, and suppression of cross striation are most frequent in the 17- to 30-hour period, less so before 7 hours and after 40 hours from inoculation. Cross striation was recorded as sharply defined in 7 of 11 mice killed before 7 hours, in 6 of 8 mice taken after 40 hours, and in 11 of 26 mice taken between 17 and 30 hours after inoculation.

Foci of myocardial lymphocyte infiltration, of valve proliferation, and of epicardial lymphoctye infiltration were recorded in a number of animals, but did not appear to be significant.

Lung.—Animals killed within the first 7 hours after inoculation usually (10 of 11) showed congestion of variable grade, about half (5) showed foci of alveolar hemorrhage, and one showed diffuse blood-tinged serous exudation in the alveoli. In the 17- to 30-hour period congestion was less frequent, appearing in 10 of 26 mice, hemorrhages were seen in 6 mice, 4 of which showed no concomitant congestion, slight to moderate serous exudation appeared in 4 mice, with congestion in 2, with hemorrhages in 1, and alone in 1. In the 40- to 70-hour period 6 of the 10 mice showed septal congestion, associated with focal hemorrhage in 2. No appreciable difference in frequency of congestion and hemorrhages was noted between animals killed and those dying in the same periods.

The trachea and bronchi showed no significant changes. Subpleural peribronchial or perivascular lymphoid nodules, or slight infiltration appeared in a few of the mice, but do not appear to be significant.

Serous membranes.—Focal to patchy, moderate to dense infiltration, chiefly by lymphocytes, was often seen in the subserous fatty tissues of the peritoneal cavity, particularly in the omentum, less often in mesentery, renal, and parametrial fat, and infrequently on the diaphragm. The capsules of liver and spleen were not involved; the peritoneum over the pancreas was involved infrequently. In 17 of the 48 mice no peritoneal lesions were recorded.

Less frequent (in 22 of 48 mice) was a similar reaction in the pleura, usually in the mediastinal fat, seldom visceral. Noteworthy pericardial infiltration of the same type was noted in 9 mice.

The frequency and extent of these reactions did not vary appreciably during the course of the intoxication, hence they are not considered significant.

Gastrointestinal tract.—Sections of esophagus from 41 animals were studied, taken 1 to 69 hours after inoculation. Focal lymphocyte infiltration was seen in the submucosa and muscularis of one; the remainder were normal. In 41 mice the stomach was studied. In 36 it was normal; in 5 there was coccidiosis of the antral mucosa, in 4 a focal lymphocyte infiltration of mucosa or submucosa, focal polymorphonuclear infiltration of mucosa with admixed and subjacent submucosal lymphocyte infiltration in 3, and in 1 numerous mitoses in the fundus glands.

Autolysis of the tips of villi, even in animals killed and autopsied immediately, was observed in one or more levels of the small intestine in 13 mice, and in 1 there was a catarrhal enteritis. Lymphoid follicles in small and large intestine showed varying grades of germinal center hyperplasia, and swollen phagocytic intrafollicular reticulum cells with ingested nuclear fragments were observed in seven mice. Round worms were encountered in sections in eight mice, in the colon five times, in the caecum three times, and in the ileum twice, one mouse showing them in all three levels.

Hyperactivity of the mucous glands was noted, usually in the colon, rectum, or both in 31 of the 48 mice, and mucoepithelial exudate was seen on the surface of the mucosa in 29. That this reaction is probably due to the action of the toxin is indicated by its absence in 7 of 12 mice killed within 7 hours, and in 4 of 10 taken more than 40 hours after inoculation, while it was present in 23 of the 26 taken between 17 and 30 hours. This may indicate colonic excretion of the toxin.

Liver.—Up to 18 hours slight to moderate congestion was present in 4 of 14 animals, from then to 30 hours moderate diffuse capillary congestion was almost regularly present, and after 40 hours slight or moderate congestion was seen in 4 of 10 mice. Scattered lymphoid nodules in the parenchyma and portal tissues were usually found in mice killed in the first 7 hours, thereafter they were infrequent. This parallels the depletion of pulp lymphoid tissue and decrease in follicle size noted in the spleen.

Usually the parenchyma showed no significant changes. Sometimes the portal halves of the lobules showed some increase in nuclear density in the liver cells. Five mice dying between 22 and 30 hours, one at 47, and one at 68 hours showed few to numerous capillary thrombi, hyaline or fibrinous in structure, often enclosing red corpuscles or cell fragments, sometimes forming hemoglobin masses up to 25μ in diameter and in five mice accompanied by coagulative or fibrinoid necrosis with karyorrhexis or karyolysis of a few abutting liver cells.

Mitoses in liver cells were noted as fairly frequent in 3 mice taken at about 48 hours from inoculation.

Pancreas.—No lesions assignable to the action of the toxin were encountered in any of 47 mice.

Spleen.—During the first 2 hours after inoculation the spleen appears normal, showing moderate blood content of the pulp, moderate accumulation of lymphoid cells adjacent to the trabeculae and capsule, moderate numbers of megakaryocytes and large follicles without germinal centers or conspicuous reticulum cells. In the 3- to 7-hour period a noteworthy congestion of the spleen pulp often appears, and megakaryocytes and lymphocytes are often somewhat diminished in numbers. In the 17- to 30-hour period pulp congestion becomes more frequent and often more marked, the earlier diminution of the peritrabecular lymphoid tissue gives way to an increase, and focal lymphocyte infiltration of the intervening pulp appears in some animals. Megakaryocytes are usually few in numbers and sometimes karyopyknotic, but in some animals they may be quite numerous.

The follicles, which remained unchanged during the first 7-hour period, in the 17- to 30-hour period show, on the average, some reduction in size, a constant, more or less marked accumulation of pyknotic nuclear fragments in dilated lymph clefts, sometimes spreading into the follicle substance as karyorrhectic necrosis, and swelling of the reticulum cells abutting on these lymph clefts, with more or less phagocytosis of the nuclear debris. In the later, 40- to 70-hour, period, less free nuclear debris is present, but the swollen reticulum cells continue their phagocytic activity in most animals. Lymphoblastic germinal centers appear in most animals in the 17- to 30-hour period and in all in the 40- to 70-hour period.

On the average, pulp congestion decreases in the 40- to 70-hour period, megakaryocytes are again present in about normal numbers, peritrabecular and pulp lymphocyte infiltration continues increased in amount and focal polymorphonuclear leucocyte accumulation is sometimes seen in the pulp.

Appreciable pulp reticuloendotheliosis, macrophage exudation and erythroblastic activity are usually absent in all stages.

Bone marrow.—Sagittal sections of three or more vertebrae from 47 mice were prepared after decalcification. The decalcification naturally interfered somewhat with cell identification. In general, the marrow was cellular, composed predominantly of myelocytes with moderate numbers of megakaryocytes, normoblasts and polymorphonuclear leucocytes and usually few eosinophils.

During the first 4 hours after the administration of the toxin, congestion or few focal hemorrhages were observed in 3 of 8 mice. From 5 hours on to 42 hours more or less marked congestion and focal to diffuse patchy hemorrhage were almost regularly present. Sometimes hemorrhage was accompanied by considerable disruption of marrow structure, and often there was a very considerable amount of nuclear pyknosis of marrow cells in hemorrhagic areas.

Three animals killed 48 hours after inoculation showed neither congestion nor hemorrhage, while three dying after 67 to 69 hours showed moderate congestion and some focal or diffuse hemorrhages. One mouse killed 41 hours after inoculation showed little hemorrhage, moderate congestion, and distinct islets of myelocytes and of normoblasts, suggesting regeneration.

Lymph nodes.—Lymph nodes were studied histologically in 45 mice, the tracheobronchial nodes in 25, various omental, mesenteric, and pancreatic nodes in 19, pelvic in 3, and interrenal nodes in 30 mice.

During the first 7 hours after inoculation (12 mice) the nodes were usually normal (15 nodes), a few of the interrenal and abdominal groups showed slight or moderate sinus reticuloendothelial hyperplasia, sinus dilatation or edema was seen in a few, and in only two cases did the interrenal nodes show swelling of intrafollicular reticulum cells with slight or moderate phagocytosis of nuclear debris.

From the 17- to 30-hour period 39 lymph nodes from 24 mice were studied, approximately equally divided between the tracheobronchial, interrenal, and mesenteric groups. The follicles were hyperplastic and contained more or less nuclear debris in dilated lymph clefts and swollen phagocytic reticulum cells. This reaction occurred in about half the nodes studied and was most frequent in mesenteric nodes, least in interrenals. The interrenal nodes more often showed sinus dilatation, and sometimes sinus hemorrhage. Such changes were less common in abdominal nodes and infrequent in tracheobronchials. Sinus reticuloendothelial hyperplasia, sometimes with macrophage exudation in the sinuses, occurred in about half of the mesenteric and interrenal nodes, infrequently in the peribronchials.

In 9 mice taken in the 40- to 70-hour period, 14 nodes, 6 peribronchial and 4 each interrenal and mesenteric, were studied. The changes were similar to those seen in the preceding period, both in character and in frequency in the various groups, except that sinus dilatation, hemorrhage, and macrophage exudation were less frequent.

Adrenals.—The adrenal was normal in 7 of the animals killed within 7 hours after inoculation. It showed moderate to marked congestion of the inner cortical zones in 3. In 2 there were respectively, single and multiple foci of interstitial hemorrhagic disruption of cortical tissue in which the included cortex cells were rounded, slightly or moderately oxyphil and karyopyknotic. The last 2 animals were killed, respectively, at 5 and 6½ hours after inoculation.

Between 17 and 30 hours after inoculation adrenals were studied in 24 animals, 6 killed and 18 dying from the effects of the toxin. In general, these animals showed more or less marked congestion, usually multiple hemorrhages, cytoplasmic oxyphilia, and karyopyknosis of cortex cells grading into complete coagulation necrosis, diffuse or focal, generally restricted to the inner third to half of the cortex, and in necrosing areas few to numerous hyaline eosinophilic globules of apparently intracapillary origin.

These hyaline globules range from 10 to 40μ in diameter. They often stain orange with eosin, similarly to the manner of red corpuscles, and sometimes outlines of red corpuscles may be discerned in parts of them. They apparently arise by conglutination and fusion of red corpuscles into masses of nearly unaltered hemoglobin within dilated capillaries.

In the latter part of this 17- to 30-hour period complete coagulation necrosis tended to be more frequent and more focal in character, and congestion was less prominent.

In animals taken 40 to 70 hours after administration of the toxin, five dying of its effects showed similar lesions in which focal coagulation necrosis was a prominent feature, congestion and hemorrhage tended to be irregular or focal in distribution, and the hyaline hemoglobin globules were less frequent. Two animals killed in this period showed no adrenal lesions, while a third presented findings similar to those found in the animals that died.

The medulla was normal in 33 of 44 mice. In 11 there was partial loss of chromaffin substance, usually in discrete focal or marginal areas, normal chromaffin staining remaining in part of the medulla in 8 mice. In 8 mice chromaffinolysis was associated with slight cytoplasmic oxyphilia and definite karyopyknosis of medulla cells. The medulla was normal in 11 of 12 mice killed in the first 7 hours and in 5 of 8 taken after the fortieth hour, while 7 of 24 dead between 17 and 30 hours after inoculation showed degenerative changes. Definite focal coagulative necrosis in the medulla was seen in one mouse dying 69 hours after inoculation.

Kidney.—Glomeruli were normal in 34 of the 48 mice, slightly to moderately congested in 13 and engorged, with a few hyaline hemoglobin thrombi, in one. Congestion was noted in 1 of 12 mice in the 1- to 7-hour period, in 1 of 10 in the 40- to 70-hour period, and in 12 of 26 in the 17- to 30-hour group.

During the 1- to 7-hour period the convoluted tubules were all normal in 8 mice, while some of the proximal convoluted and coarse loop tubules showed some swelling, fine basal granularity, and possibly swelling or fraying of red borders in the other four. In the 17- to 30-hour period these tubules remained normal in 4 mice, in 13 part of them were normal, part swollen or dilated, with cloudy or finely granular basal cytoplasm and normal, swollen, hyalinized or frayed rod borders. Similar degeneration was general in the remaining 9 mice. In 12 there was more or less hyaline, granular or foamy serous exudate in dilated tubules. Later, in the 40- to 70-hour period, similar degenerative changes were general in 3 mice, affected part of the tubules in 3, and in 4 the tubules were normal.

In the 1- to 7-hour period the medulla and papilla were normal. Between 17 and 30 hours the medulla regularly showed moderate to extreme congestion, and its tubules were often oxyphil, more or less frayed toward their lumina, and usually also karyopyknotic. Total necrosis of tubules was not encountered. The renal papilla showed a less frequent and usually quite moderate congestion without tubular degeneration. A little focal epithelial calcification in the papilla was noted in 1 mouse. After 40 hours this intense engorgement of the medulla was usually absent and the tubules of the medullary rays were normal.

Diffuse or nodular lymphocyte infiltration along the sheaths of the cortical arteries was frequently noted in the early period (9 of 12 mice) and is probably not particularly abnormal. This periarterial lymphocyte infiltration became less frequent (7 of 26 mice) in the following (17- to 30-hour) period, and remained infrequent (3 of 7 mice) in the late (40- to 70-hour) period.

Male genital organs.—No lesions were seen in the testis, epididymis, or seminal vesicle of any of 5 mice.

Ovary.—In the first 7 hours focal hemorrhage into Graafian follicles was seen in 1 mouse, and the ovaries were normal in 5. Ovaries were studied in 19 mice from the 17- to 30-hour period. In 6 they were normal, 5 showed interstitial or lunate peripheral hemorrhages in mature follicles, 6 karyorrhexis grading into coagulation necrosis in thecal epithelium, 1 with a coagulated necrotic ovum centrally. Two showed focal interstitial hemorrhage in addition to follicle hemorrhage. Focal hemorrhage into corpora lutea was seen in 6 mice, in 2 accompanied by oxyphilia and necrosis of lutein cells, and in one of these by numerous hemoglobin globules similar to those described in the liver and adrenal. Normal corpora lutea were recorded in 6 mice and in 7 none was encountered. Ovaries from two mice taken in the 40- to 70-hour period were normal.

Uterus, oviducts, vagina.—A considerable number of mice showed slight to moderate endometrial infiltration by polymorphonuclear leucocytes, focal lymphocyte infiltration, and sometimes eosinophils, often more marked in the cervical mucosa and here and in the vagina accompanied by some parakeratosis and emigration of leucocytes through the epithelium. Sometimes cellular infiltration extended into the muscularis and perimetrium, where it was more often lymphocytic in character. The oviducts and fimbriae were usually not involved.

In view of the fact that low-grade nonpuerperal endometritis is not uncommon in mice, the significance of these findings is not clear. However, slight endometritis was noted in 4 of 11 mice in the first 7 hours and became more frequent in the 17- to 30-hour period (12 slight, 3 moderate in 24 mice) and in the 40- to 70-hour group (1 slight, 2 moderate in 5 mice). Hence it would seem that the action of the toxin may have increased the frequency and severity of the endometritis, if it did not initiate it.

Urinary bladder.—The urinary bladder from 21 mice was studied histologically and no lesions were found.

Thymus.—Congestion and reticulum cell swelling were noted in 1 mouse, fatty replacement in 1, and no lesions in 4.

Spinal cord.—Partial tigrolysis occurred in 4 of 12 mice killed 1 to 7 hours after inoculation. Later about half of the animals showed partial to complete tigrolysis, perhaps accompanied by cytoplasmic vacuolation, nuclear shrinkage, and karyoplasmic oxyphilia. Slight to moderate congestion of the gray substance accompanied the tigrolysis in 7 of 18 cases. In 5 mice there was focal meningeal or perivascular lymphocyte infiltration of slight to moderate grade. The significance of this finding is not clear.

Spinal and sympathetic ganglia.—Spinal ganglia were studied in 15 mice, sympathetic in 28, partial tigrolysis of nerve cells in 1. Sympathetic ganglion was the only recorded abnormality.

Skeletal muscle.—Normal in all animals.

SUMMARY

The toxin of *Clostridium sordellii* (*bifermentans*) induces congestion of lungs, liver, spleen, adrenal, and bone marrow, usually reaching its maximum in about 24 hours. Hemorrhages ensue in lungs, marrow, adrenals, renal medulla, ovaries, and sometimes lymph nodes, and hyaline or hemoglobin thrombi appear, most often in the adrenals, sometimes in the liver, and occasionally in renal glomeruli. Accompanying these changes is a destruction of lymphoid tissues, manifested by decrease in frequency of lymphoid nodules in certain parenchymatous organs, a decrease in size of splenic follicles, and accumulation of nuclear debris in the lymph clefts of the follicles of spleen and lymph nodes, with ingestion of the fragments by swollen reticulum cells in the follicles. With the congestion and hemorrhages there is diffuse and focal degeneration grading into coagulation necrosis in the inner portion of the adrenal cortex, and similar degeneration without necrosis appears in the medullary rays of the kidneys. Other findings are a low grade endometritis and a catarrhal colitis which become more pronounced and more frequent at about the end of the first day. Mild parenchymatous degeneration is noted in renal cortex and heart muscle, and tigrolysis and nerve cell vacuolation are seen in the spinal cord.

(AUTHOR'S NOTE.—While recent work of Stewart (*9*) and of Clark and Hall (*10*) indicates that *Cl. sordellii* and *Cl. bifermentans* may be the same species, this is not yet regarded as sufficiently established to warrant the use of the older name *Cl. bifermentans* in the title of this paper.)

REFERENCES

(*1*) Sordelli, A.: Rev. Assoc. Med. Argent., 35: 272, 308 (1922), cited from Hall, Rymer and Jungherr., and ibid., 36: 20 (1923).

(*2*) Hall, I. C., and Scott, J. P.: Bacillus sordellii, a cause of malignant oedema in man. J. Infect. Dis., 41: 329 (1927).

(*3*) Hall, I. C., Rymer, M. R., and Jungherr, E.: Comparative study of Bacillus sordellii (Hall and Scott) and Clostridium oedematoides (Meleney, Humphreys and Carp). J. Infect. Dis., 45: 42 (1929).

(*4*) Vawter, L. R.: Personal communication cited by Hall, I. C., *in* The Occurrence of Bacillus sordellii in icterohemoglobinuria of cattle in Nevada. J. Infect. Dis., 45: 156 (1929).

(*5*) Meleney, F. L., Humphreys, F. B., and Carp, L.: Pathogenic anaerobic bacillus not hitherto described from fatal operative wound infection. Proc. Soc. Exp. Biol. and Med., 24: 675 (1927).

(*6*) Meleney, F. L., Humphreys, F. B., and Carp. L.: An unusual fatal operative wound infection yielding a pathogenic anaerobe of the gas gangrene group not hitherto described. Surg. Gyn. and Obst., 45: 775 (1927).

(*7*) Hall, I. C.: The principal postmortem findings in guinea pigs inoculated with pure cultures of pathogenic anaerobic bacilli. J. Bact., 15: 17 (1928).

(*8*) Hall, I. C., and Gray, S. H.: Septic peritonitis in man due to Bacillus sordellii. Arch. Path., 12: 245 (1931).

(*9*) Stewart, S. E.: Unpublished studies on the identification of Cl. sordellii with Cl. bifermentans.

(*10*) Clark, F. E., and Hall, I. C.: A comparative study of Bacillus bifermentans (Tissier and Martelly), Bacillus centrosporogens (Hall), and certain closely related proteolytic anaerobes. Proc. 38 Ann. Med. Soc., Am. Bact. J. Bact., 33: 23 (1937).

THE POLLUTION PROBLEM IN THE OHIO RIVER DRAINAGE BASIN[1]

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During the past 2 years or more in which there has been a concerted effort for pollution abatement on the Ohio River watershed, information has been forthcoming on the effect, at many points, of the pollution being discharged in the form of untreated domestic sewage and industrial wastes.

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[1] Presented before the Ohio Valley Improvement Association, Cincinnati, Ohio, September 28, 1937.

Sufficient detailed information is not available at present to state definitely the pollution problems that exist at all points on the watershed. However, during the past 20 years, Federal, State, and municipal agencies have gathered considerable information as to sanitary conditions at various points in the Ohio River valley which would seem indicative of the pollutional problems which might exist in other localities where the conditions were somewhat similar but for which detailed information was entirely lacking.

This information has again been reassembled in an attempt at a nontechnical and brief summary to present a picture of what are believed to be the public health aspects of the present pollution in the Ohio River.

In discussing the existing pollution, the watershed may be conveniently divided into (*a*) the upper drainage basin, extending downstream to below the Ashland-Ironton area on the main river, some 350 miles below Pittsburgh, in the watercourses of which the pollution problem is complicated by the presence of varying amounts of acid mine drainage from past and present coal-mining operations; and (*b*) the lower watershed from Portsmouth, Ohio, to the mouth, in which the acid drainage and its effects have largely disappeared and the pollution problem is one of the effect of untreated domestic sewage and manufacturing wastes.

Both on the Ohio River proper and for varying distances above the mouths of many of the larger tributaries, the pollution problem is still further complicated, during the critical summer months of decreased stream discharge, when objectionable conditions due to pollution are most likely to occur, by the presence of numerous dams constructed to form navigation pools during these periods of minimum run-off.

As a result of the operation of these navigation dams, any discussion of the present effect of sewage and waste pollution should include a statement of conditions on the watershed during periods of pool stage and minimum river discharge and at times of increasing run-off following pool stages.

POLLUTION PROBLEMS ON UPPER OHIO RIVER

In the Pittsburgh area at the present time, sufficient pollution in the form of untreated sewage and industrial wastes is reaching the Ohio River at low flows and pool stage to cause extremely offensive conditions during a considerable portion of the time.

It is estimated that the flow of the Ohio River at Pittsburgh has decreased to 1,000 second-feet at times and that it carries the sewage of a population of some 2 million people, representing a minimum dilution ratio of 0.5 second-feet per 1,000 of contributing population.

In a stream such as the Ohio River at Pittsburgh, the dilution ratio should probably be from between 10 to 15 second-feet per 1,000 of contributing population in order to prevent nuisance conditions; yet with a flow past Pittsburgh at times of from one-thirtieth to one-twentieth of that necessary to prevent nuisances, actually no extremely offensive conditions do exist in this section of the river.

It has been estimated that the Ohio River and its tributaries receive daily some 25 million pounds of sulfuric acid derived from abandoned and active coal mines, of which some 60 percent reaches the watercourses above Pittsburgh.

Acid mine drainage at Pittsburgh tends to coagulate and settle out sewage and industrial waste solids in the navigation pools during low river stages and also inhibits bacterial action or actually destroys many of the sewage organisms. As a consequence, biological activities which ordinarily would take place in sludge deposits, causing septic conditions accompanied by possible nuisances, do not take place in the Pittsburgh pools. That disturbance of normal biological activity by acid drainage is preventing nuisance conditions in the Pittsburgh area was indicated some years ago, when comparisons between the per capita contribution of bacteria to the river at Cincinnati, below the effects of acid drainage, and that at Pittsburgh and Wheeling, within the zone of acid influence, indicated that during the months of June to October the per capita contribution of bacteria at Pittsburgh was consistently less than 1 percent and from Wheeling less than 5 percent of that from Cincinnati. In January to March, with higher stream discharges, lessening the concentration of acid pollution, the per capita contribution at Pittsburgh was still only from 15 to 27 percent of that from Cincinnati.

It appears, therefore, that the acid drainage in the river at Pittsburgh has up to now effectually prevented nuisances, in the critical summer periods, which otherwise would have existed. In a recent report, the National Resources Committee stated that "A slight increase in pollution or a decrease of the acid content will unquestionably occasion a serious nuisance in the Pittsburgh area during such periods."

For the past few years an intensive program of sealing abandoned coal mines has been in operation in the upper watershed for the removal of mine drainage reaching the river. On the other hand, with normal population increases on the watershed, the future sewered population may be expected to increase. How these two factors may operate to change future pollutional conditions in the Pittsburgh area cannot be forecast. It can, however, be stated that conditions in the future in this area should tend to become more critical rather than to improve.

From the standpoint of public health, the greatest effect of pollution, along the whole river, is on the public water supplies taken from the stream. Over 5 million people obtain their drinking water from the Ohio River basin, the Ohio River proper being the only available source of supply for approximately 2½ million people, who use an average of some 350 million gallons per day, after the water has been passed through elaborate and expensive purification processes.

When increases in river discharge take place at Pittsburgh, following periods of pool stage, to the extent that scouring velocities are produced, the sludge deposited in the pools is flushed downstream, and, because of greater dilution of the acids, less inhibitive action results and more normal biological action takes place in the stream. As a consequence, a series of highly concentrated waves of organic and bacterial pollution pass downstream to affect the operation of water-treatment plants below, imposing upon them for varying periods of time a pollution load far in excess of that for which they were designed. At such times a slip in operating technique might easily result in the appearance of water-borne diseases within the community. Following the flushing-out process, increasing river velocities bring pollution rapidly from upstream sources to the waterworks intakes before agencies of natural stream purification have time to operate, so that in the Ohio River the maximum degree of raw-water pollution at waterworks intakes does not occur at times of minimum run-off but during periods when the discharge is considerably above the minimum flow.

At East Liverpool, immediately below Pittsburgh, the limit of bacterial pollution which the usual type of water filtration plant would be expected to handle satisfactorily is exceeded during about 50 percent of the time, based on the average monthly results of bacterial determinations at the waterworks plant. At Steubenville, Wheeling, Marietta, and Huntington, the intensity of pollution decreases, and, in the order of the communities named, the limit of raw-water pollution was exceeded about 16, 15, 12, and 1 percent of the time, respectively.

The greatest concentration of bacterial pollution anywhere on the Ohio River occurs within the Ashland-Ironton area, as indicated by some 10 years of daily analytical results at the water-filtration plants of these communities.

Whether this excessive pollution is due to local sources close to water intakes or is a combination of local pollution to which has been added the effect of upstream pollution, perhaps as far as Pittsburgh, which has again become active, after lying dormant, owing to the effects of acid concentration, cannot be stated, because, unfortunately, no intensive surveys have ever been made of the effect of pollution in this particular area.

Suffice it to state, however, that such excessive pollution does apparently exist in the Ashland-Ironton area, irrespective of the cause.

Based on monthly averages of bacterial analyses at the Ashland and Ironton waterworks plants during the 10-year period 1926–35, the probable limit of raw-water pollution that the usual type of water-filtration plant would be expected to remove from the untreated water was exceeded about 97 percent of the time at Ashland and 75 percent of the time at Ironton. Detailed figures of fluctuations in bacterial concentration indicate the necessity for extremely careful operation of such greatly overloaded filtration plants in order to prevent water-borne epidemic diseases, and show the narrow margin of safety that must exist, perhaps for considerable periods of time, where water so highly polluted is used as a domestic supply.

While no extensive data are available as to the effect of pollution on many of the tributary watercourses of the upper watershed, the effect of acid drainage in the Pittsburgh area would suggest that acid pollution has a tendency to prevent or greatly reduce the effects of sewage and industrial waste pollution in the immediate vicinity of the points of discharge, tending to prevent nuisances during the periods of minimum stream flows, when nuisance conditions would usually be expected. Increasing velocities following low water flows tend to scour out any deposited sewage materials and, at such times, waves of concentrated pollution pass downstream to intensify the raw-water pollution to the point that water-treatment plants may have great difficulty in furnishing a supply to meet present-day standards of quality.

POLLUTION PROBLEMS OF LOWER OHIO RIVER

In the lower section of the Ohio River the pollution problem is not yet complicated by the presence of acid mine drainage.

During periods of minimum flow, there is a tendency, as on the upper watershed, for sewage materials to be deposited close to centers of population, such as at Cincinnati and Louisville, and to form sludge banks in the pools near points of discharge. In the absence of acid drainage in the lower river, normal biological processes take place, with a decrease of dissolved oxygen in the water, and at some points, as at Cincinnati in 1930, complete depletion of oxygen has indicated an approach toward nuisance conditions along the water front. Under such conditions the sewage pollution reaching the river affects those communities producing it, rather than down-stream communities as occurs in a free-moving river.

During periods of minimum flow, the water arrives at the waterworks intakes exceptionally free from bacterial pollution, because of sedimentation in the pools above and because of the long periods of flow from upstream sources of pollution, during which time natural agencies of stream purification have time in which to operate.

In some instances, at pool stage, local pollution from points downstream, especially when entering through tributaries, may move upstream to affect the community's own water supply. Such is undoubtedly the case at Cincinnati when storms on the Little Miami River cause exceedingly rapid run-off and reversal of flow in the Cincinnati pool may result in pollution from the Little Miami River being carried upstream to the waterworks intake. In 1930 a reversal of flow in the Elk River, the source of Charleston's supply, brought excessive pollution to the intake and the production of widespread intestinal disturbance. There are some indications that, at times of low flow in the Ohio, the Muskingum River causes a reversal of flow, bringing Marietta's sewage upstream to the waterworks intake.

With increasing flows, conditions change in the lower river, resulting in increased pollution at the water works intakes and decreased pollution along the waterfront. First, scour of upstream deposits places an exceedingly heavy bacterial load on the water-treatment plants, which may or may not diminish with continued increase in discharge, depending upon the rapidity of flow from upstream sewer outlets. With increased discharge, however, the tendency toward nuisance conditions at points of sewage discharge along the water front is lessened because of additional dilution.

On the basis of monthly averages for the 10-year period 1926-35, the limit of bacterial pollution that the types of filtration plants at Cincinnati and Louisville could reasonably be expected to handle and produce a satisfactory water supply was exceeded 27 percent of the time at Cincinnati and 13 percent of the time at Louisville.

Immediately below Cincinnati and Louisville, at Aurora and New Albany, the effects of upstream pollution increase the percentage of time that the limit of raw water pollution was exceeded, respectively, from 27 to 79 percent Cincinnati to Aurora, and from 13 to 41 percent Louisville to New Albany. This marked increase in water pollution indicates the effect at downstream waterworks of the sewage from major centers of population immediately above. At Mount Vernon, towards the mouth of the river, below Evansville and Henderson, the limit of bacterial concentration for efficient removal by water-filtration plants was exceeded 26 percent of the time, indicating that pollution is also considerable, at least at some points toward the mouth of the river.

As on the upper watershed, the greatest effect on public health of existing pollution in the Ohio River is on the public water supplies, and occurs, not at times of exceedingly low flow, but when river discharges are considerably above the minimum and velocities of flow are relatively high.

Of great public health significance, and applicable to the entire watershed, is the possible effect at times on water consumers of using a purified supply derived from a highly polluted source. Such waters appear to contain substances which act as intestinal irritants, derived either from sewage or industrial wastes or produced by chemical or bacterial action from them and which are not removed by the ordinary processes of water treatment; neither are they indicated by the usual tests for a potable and safe water.

Following the long period of pool stage along the Ohio River in the fall and winter of 1930–31, an extensive outbreak of gastroenteritis occurred in the Sistersville, Moundsville, and Wheeling area, also on the Kanawha River at Charleston, and down the Ohio, successively, at Huntington, Ironton, Ashland, Portsmouth, Cincinnati, and Louisville. In communities not using the Ohio River as a source of supply, such as Hamilton, Dayton, Columbus, and Norwood, there appeared to be no evidence of similar outbreaks.

The evidence suggests that these extensive intestinal disturbances resulted from the presence of some soluble substance or combination of substances formed in the pools during the extremely long period of pool stage, in concentrations much higher than are normally present in the river water and sufficient to act as intestinal irritants.

Of considerable importance would seem to be the question of how long in the future sewage and industrial wastes can continue to increase until conditions affecting the public health, such as prevailed at the time of exceptionally low flow, may occur under the usual and more frequent conditions of average low summer stream flow at pool stage.

To sum up briefly the pollution problem in the Ohio River basin as it exists at the present time, on the basis of available information, it appears that—

1. Pollution at Pittsburgh has reached the point where nuisances would occur in the summer months if it were not for the effects of acid mine drainage present.
2. Acid drainage, while decreasing the effect of pollution near the point of discharge, may be responsible for excessive pollution downstream, owing to its action of delaying bacterial activity until dilution has removed the inhibitive action of the acid.
3. The removal of large amounts of acid, together with normal increases in sewage and industrial waste pollution, will decrease the inhibitive action of the acid and tend to confine the effects of pollution coming from the Pittsburgh area to that vicinity, with the possible production of nuisances at Pittsburgh if sufficient acid is removed.
4. Pollution at Cincinnati, and probably at other points, has at times reached such a concentration, in the absence of acid drainage, that oxygen depletion is occurring. Future increases in pollution will be conducive to actual nuisance conditions along the water fronts of such communities.

5. From the standpoint of public health, the greatest problem of existing pollution is its effect on public water supplies—

(*a*) By the overloading of water-treatment devices to the point of passing intestinal disease organisms, conditions which now appear to have been approached in the Ashland and Ironton area most of the time and at a number of other places a large percentage of the time, and

(*b*) By the production of intestinal irritants in the water, during long periods of pool stage, which are not removed by filtration nor indicated by the usual tests of a potable water. As pollution increases, the tendency may be toward the production of such irritants more frequently at times of more nearly average summer flow rather than at times of extreme low water as in the past.

The solution of these problems, resulting mainly from the solid material and the bacteria of the sewage and industrial wastes, would appear to be in their removal, the solids by methods of sewage treatment, the bacteria by disinfection.

The degree of treatment required at specific points on the watershed or the order of installing the necessary treatment devices for the greatest improvement in sanitary conditions for the least expenditure, can be ascertained only after more detailed information becomes available on the amount and distribution of pollution and the relations that exist between the several factors influencing the effect of pollution after reaching the watercourses.

REPORT ON MARKET-MILK SUPPLIES OF CERTAIN URBAN COMMUNITIES

Compliance of the Market-Milk Supplies of Certain Urban Communities With the Grade A Pasteurized and Grade A Raw Milk Requirements of the Public Health Service Milk Ordinance and Code (as Shown by Compliance (not Safety) Ratings of 90 Percent or More Reported by the State Milk Sanitation Authorities During the Period January 1, 1936, to December 31, 1937)

The accompanying list gives the ninth semiannual revision of the list of certain urban communities in which the pasteurized market milk is both produced and pasteurized in accordance with the Grade A pasteurized milk requirements of the Public Health Service Milk Ordinance and Code, and in which the raw market milk sold to the final consumer is produced in accordance with the Grade A raw milk requirements of said ordinance and code, as shown by ratings of 90 percent or more reported by State milk-sanitation authorities.

These ratings are not a complete measure of safety, but represent the degree of compliance with the Grade A requirements of the Public Health Service Milk Ordinance and Code. Safety estimates should also take into account the percentage of milk pasteurized, which is given in the following tables.

The primary reason for publishing such lists from time to time is to encourage the communities of the United States to attain and maintain a high level of excellence in the public health control of milk supplies.

It is emphasized that the Public Health Service does not intend to imply that all communities not on the list are not provided with high-grade milk supplies. Some communities which have high-grade milk supplies are not included because arrangements have not been made for the determination of their ratings by the State milk-sanitation authority. In other cases the ratings which have been determined are now more than 2 years old and have therefore lapsed. In still other communities with high-grade milk supplies there seems, in the opinion of the community, to be no local necessity nor desire for rating or inclusion in the list, nor any reasonable local benefit to be derived therefrom.

The rules under which a community is included in this list are as follows:

(1) All ratings must have been determined by the State milk-sanitation authority in accordance with the Public Health Service rating method, based upon the Grade A pasteurized milk and the Grade A raw milk requirements of the Public Health Service Milk Ordinance and Code.

(2) No community will be included in the list unless both its pasteurized milk and its raw milk ratings are 90 percent or more, provided that communities in which only raw milk is sold will be included if the raw milk ratings are 90 percent or more.

(3) The rating used will be the latest rating submitted to the Public Health Service, but no rating will be used which is more than 2 years old.

(4) The Public Health Service will make occasional surprise check surveys of cities for which ratings of 90 percent or more have been reported by the State. If such surprise check rating is less than 90 percent but not less than 85, the city will be removed from the 90 percent list after 6 months unless a resurvey submitted by the State during this probationary interim shows a rating of 90 percent or more. If, however, such surprise check rating is less than 85 percent, the city will be removed from the list immediately.

Communities are urgently advised to bring their ordinances up to date at least every 5 years, since ratings will be made on the basis of later editions if those adopted locally are more than 5 years old.

Communities which are not now on the list and desire to be rated should request the State milk-sanitation authority to determine their ratings and, if necessary, should improve their status sufficiently to merit inclusion in the list.

Communities which are now on the list should not permit their ratings to lapse, as ratings more than 2 years old cannot be used.

Communities which have not adopted the Public Health Service Milk Ordinance may wish to give thoughtful consideration to the advisability of doing so. It is obviously easier to satisfy the requirements upon which the rating method is based if these are included in the local legislation.

Communities which are enforcing the Public Health Service Milk Ordinance, but which have not yet been admitted to the list, should determine whether this has been the result of failure to enforce the ordinance strictly or failure to bring the ordinance up to date.

State milk-sanitation authorities which are not now equipped to determine municipal ratings are urged, in fairness to their communities, to equip themselves as soon as possible. The personnel required is small, as in most States one milk specialist is sufficient for the work.

The inclusion of a community in this list means that the pasteurized milk sold in the community, if any, is of such a degree of excellence that the weighted average of the percentages of compliance with the various items of sanitation required for Grade A pasteurized milk is 90 percent or more and that, similarly, the raw milk sold in the community, if any, so nearly meets the requirements that the weighted average of the percentages of compliance with the various items of sanitation required for Grade A raw milk is 90 percent or more. However, high-grade pasteurized milk is safer than high-grade raw milk, because of the added protection of pasteurization. To secure this added protection, those who are dependent on raw milk can pasteurize the milk at home in the following simple manner: Place the milk in an aluminum vessel on a hot flame and heat to 155° F., stirring constantly; then immediately set the vessel in cold water and continue stirring until cool.

TABLE 1.—*Communities in which all market milk is pasteurized in these communities market milk complies with the Grade A pasteurized milk requirements of the Public Health Service Milk Ordinance and Code to the extent shown by pasteurized milk ratings of 90 percent or more* [1]

Community	Percentage of milk pasteurized	Date of rating
MINNESOTA		
Winona	100	Oct. 30, 1936.
NORTH CAROLINA		
Clinton	100	Sept. 3, 1937.
Fort Bragg	100	Sept. 7, 1937.
Greenville	100	Dec. 16, 1936.
Princeville	100	Nov. 12, 1936.
Sanford	100	June 22, 1937.
Tarboro	100	Nov. 12, 1936.

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[1] Note particularly the percentage of milk pasteurized in the various communities listed in these tables. This percentage is an important factor to consider in estimating the safety of a city's milk supply.

TABLE 2.—*Communities in which some market milk is pasteurized—in these communities the pasteurized market milk complies with the Grade A pasteurized milk requirements and the raw market milk complies with the Grade A raw milk requirements of the Public Health Service Milk Ordinance and Code to the extent shown by pasteurized and raw milk ratings, respectively, of 90 percent or more* [1]

(NOTE.—All milk should be pasteurized or boiled, either commercially or at home, before it is consumed. See text for home method.)

Community	Percentage of milk pasteurized	Date of rating
ALABAMA		
Huntsville	82	Dec. 16, 1936.
Montgomery	27	Dec. 4, 1936.
ARKANSAS		
Fayetteville	60	November 1937.
Jonesboro	29	June 1937.
Little Rock	38	October 1937.
Pine Bluff	31	June 1937.
Texarkana	39	Do.
FLORIDA		
Coral Gables	89	May 1937.
Fort Lauderdale	64	Do.
Key West	43	August 1937.
Miami	89	May 1937.
ILLINOIS		
Chicago	99.7	Jan. 22, 1937.
KANSAS		
Junction City	31	June 1936.
Lawrence	48	May 1936.
Ottawa	13	January 1938.
Topeka	59	May 1936.
Wichita	69	November 1937.
KENTUCKY		
Ashland	86	June 1936.
Bowling Green	48	April 1937.
Glasgow	67	Do.
Louisville	98	June 1937.
MINNESOTA		
Albert Lea	97	Oct. 23, 1936.
Little Falls	64	Dec. 1, 1937.
MISSISSIPPI		
Tupelo	28	Oct. 19, 1937.
MISSOURI		
Hannibal	31	May 29, 1936.
Moberly	49	May 1, 1936.
Sedalia	20	Apr. 10, 1936.
NEW MEXICO		
Deming	12	October 1937.
NORTH CAROLINA		
Bryson City	50	Jan. 19, 1937.
Charlotte	34	June 10, 1937.
Durham	89	Apr. 3, 1937.
Elizabethtown	65	Sept. 1, 1937.
Fayetteville	52	Sept. 30, 1936.
Franklin	68	Jan. 20, 1937.
Greensboro	70	November 1937.
High Point	85	December 1937.
NORTH CAROLINA—con.		
Hope Mills	40	Sept. 30, 1936.
Kinston	16	Apr. 10, 1936.
New Bern	72	Nov. 26, 1937.
Oxford	7	May 20, 1937.
Rockingham	55	Nov. 3, 1937.
Rocky Mount	35	Dec. 19, 1936.
Salisbury	50	Dec. 2, 1937.
Winston-Salem	60	August 1937.
OKLAHOMA		
Bartlesville	42	Dec. 20, 1937.
Blackwell	48	June 3, 1936.
Okmulgee	57	June 25, 1937.
Tulsa	72	Apr. 22, 1937.
OREGON		
Astoria	59	June 5, 1937.
Portland	78	August 1937.
TENNESSEE		
Dyersburg	21	May 18, 1937.
Knoxville	69	Apr. 16, 1937.
Memphis	84	June 3, 1937.
Union City	33	May 21, 1936.
TEXAS		
Abilene	77	Mar. 17, 1937.
Amarillo	62	July 3, 1937.
Ballinger	50	Mar. 2, 1936.
Beaumont	52	June 1937.
Big Spring	27	Mar. 22, 1937.
Brownwood	19	Aug. 11, 1937.
Corsicana	19	Mar. 12, 1937.
Dallas	75	May 3, 1937.
El Paso	69	Apr. 7, 1937.
Fort Worth	80	February 1937.
Gainesville	60	Dec. 3, 1937.
Galveston	75	August 1936.
Kerrville	72	May 8, 1936.
Livingston	20	March 1936.
Midland	51	Mar. 23, 1937.
Port Arthur	41	June 1937.
San Angelo	60	Apr. 17, 1937.
San Antonio	70	Apr. 16, 1937.
Seguin	51	June 8, 1937.
Sweetwater	53	Mar. 18, 1937.
Texarkana	41	Mar. 24, 1937.
Tyler	60	January 1936.
Waco	47	July 8, 1937.
VIRGINIA		
Pulaski	39	May 28, 1937.
WASHINGTON		
Vancouver	31	Oct. 9, 1936.
Walla Walla	49	November 1937.
WEST VIRGINIA		
Huntington	65	Dec. 16, 1937.

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[1] Note particularly the percentage of milk pasteurized in the various communities listed in these tables. This percentage is an important factor to consider in estimating the safety of a city's milk supply.

TABLE 3.—*Communities in which no market milk is pasteurized, but in which the raw market milk complies with the Grade A raw milk requirements of the Public Health Service Milk Ordinance and Code to the extent shown by raw milk ratings of 90 percent or more* [1]

(NOTE.—All milk should be pasteurized or boiled, either commercially or at home, before it is consumed. See text for home method.)

Community	Date or rating
ALABAMA	
Scottsboro	Dec. 31, 1935.
FLORIDA	
Marianna	October 1937.
KANSAS	
Horton	Sept. 1, 1936.
Sabetha	Sept. 25, 1936.
MISSISSIPPI	
Brookhaven	May 31, 1937.
Durant	June 9, 1937.
Yazoo City	June 8, 1937.
MISSOURI	
Ash Grove	July 9, 1936.
NEW MEXICO	
Raton	Dec. 21, 1937.
NORTH CAROLINA	
Ahoskie	June 25, 1937.
Angier	May 18, 1936.
Aulander	June 24, 1937.
Black Mountain	July 13, 1937.
Bladenboro	Sept. 1, 1937.
Buies Creek	Nov. 9, 1936.
Canton	June 29, 1937.
Cary	Apr. 23, 1936.
Clarkton	Sept. 1, 1937.
Coats	May 18, 1936.
Colerain	Oct. 11, 1937.
Dunn	May 18, 1936.
Elkin	Sept. 24, 1937.
Erwin	May 18, 1936.
Fairmont	May 28, 1936.
Kelford	Oct. 11, 1937.
Lewiston	Do.
NORTH CAROLINA—continued	
Lillington	Nov. 9, 1936.
Lumberton	May 28, 1936.
Manteo	Sept. 27, 1937.
Mount Holly	Oct. 28, 1937.
North Wilkesboro	Nov. 11, 1936.
Pinehurst	Nov. 7, 1936.
Powellsville	Oct. 11, 1937.
Raeford	May 29, 1936.
Red Springs	May 28, 1936.
Roanoke Rapids	Apr. 6, 1936.
Roxobel	Oct. 11, 1937,
Southern Pines	Nov. 11, 1936.
Southport	Nov. 18, 1937.
Spindale	June 30, 1937.
Sylva	June 21, 1937.
Whiteville	Dec. 18, 1936.
Williamston	Nov. 19, 1936.
Wilkesboro	Nov. 11, 1936.
Windsor	June 24, 1937.
Winton	June 25, 1937.
OKLAHOMA	
Kingfisher	Nov. 22, 1937.
TENNESSEE	
Jonesboro	June 24, 1937.
Savannah	June 15, 1937.
TEXAS	
Brenham	June 11, 1936
Canyon	July 15, 1937.
Childress	Apr. 17, 1936.
Colorado	Mar. 19, 1937.
Commerce	Mar. 16, 1937.
Crockett	May 1936.
Del Rio	June 8, 1937.
Jacksonville	January, 1936.
WASHINGTON	
Camas	Oct. 9, 1936.

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[1] Note particularly the percentage of milk pasteurized in the various communities listed in these tables. This percentage is an important factor to consider in estimating the safety of a city's milk supply.

DEATHS DURING WEEK ENDED JANUARY 8, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Jan. 8, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	9,514	11,401
Average for 3 prior years	9,903	
Deaths under 1 year of age	551	719
Average for 3 prior years	614	
Data from industrial insurance companies:		
Policies in force	69,937,677	69,168,624
Number of death claims	11,288	14,283
Death claims per 1,000 policies in force, annual rate	8.4	10.8

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (______) indicate that cases or deaths may have occurred, although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 15, 1938, and Jan. 16, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Jan. 15, 1938	Week ended Jan. 16, 1937	Week ended Jan. 15, 1938	Week ended Jan. 16, 1937	Week ended Jan. 15, 1938	Week ended Jan. 16, 1937	Week ended Jan. 15, 1938	Week ended Jan. 16, 1937
New England States:								
Maine	3	______	7	19	66	90	1	0
New Hampshire	______	______	______	66	39	22	0	0
Vermont	______	______	______	______	248	1	0	0
Massachusetts	4	7	______	______	95	1,052	1	2
Rhode Island	______	______	______	22	1	74	0	1
Connecticut	7	5	10	995	17	293	1	0
Middle Atlantic States:								
New York	31	55	[1] 14	[1] 926	389	300	4	20
New Jersey	18	18	13	345	824	445	4	4
Pennsylvania	64	39	______	______	5,474	135	6	4
East North Central States:								
Ohio	34	55	______	352	1,094	70	6	11
Indiana	65	25	11	283	277	12	3	4
Illinois	37	36	28	353	1,978	13	7	11
Michigan	13	21	2	97	579	69	2	5
Wisconsin	4	7	34	1,300	501	19	0	8
West North Central States:								
Minnesota	4	8	2	88	9	31	0	2
Iowa	4	2	5	3,152	34	7	0	1
Missouri	21	10	118	818	1,251	7	0	2
North Dakota	______	2	2	232	5	______	0	1
South Dakota	1	______	1	412	______	5	0	0
Nebraska	4	______	______	99	2	5	0	0
Kansas	14	10	32	3,106	158	9	2	1
South Atlantic States:								
Delaware	2	5	2	22	2	117	0	0
Maryland [2]	8	15	15	176	11	291	0	12
District of Columbia	5	19	1	107	7	23	1	2
Virginia	21	39	______	______	212	71	3	10
West Virginia	16	14	52	72	261	17	4	4
North Carolina [3] [4]	25	47	26	79	627	98	4	6
South Carolina [3]	2	14	673	652	134	62	3	4
Georgia [3]	10	8	______	______	185	______	0	3
Florida [3]	25	9	11	12	65	______	5	3
East South Central States:								
Kentucky	15	9	61	399	157	84	6	16
Tennessee	19	18	252	873	250	4	7	2
Alabama [3]	19	20	300	384	157	8	18	7
Mississippi [2]	4	9	______	______	______	______	2	1
West South Central States:								
Arkansas	25	6	182	245	236	______	0	0
Louisiana	22	11	51	288	2	122	1	2
Oklahoma [5]	22	8	100	564	15	13	0	2
Texas [3]	68	67	619	984	84	298	1	4

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 15, 1938, and Jan. 16, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Jan. 15, 1938	Week ended Jan. 16, 1937	Week ended Jan. 15, 1938	Week ended Jan 16, 1937	Week ended Jan. 15, 1938	Week ended Jan. 16, 1937	Week ended Jan. 15, 1938	Week ended Jan. 16, 1937
Mountain States:								
Montana		1		2,796	1	1	1	0
Idaho	2	2	6	259	10	55	1	0
Wyoming	3				1	1	0	0
Colorado	12	5		[6] 86	108	4	0	2
New Mexico	3	4	2	72	147	35	1	1
Arizona	6	2	51	886		136	0	1
Utah [2]	5	1			72	83	8	1
Pacific States:								
Washington		3	1	26	25	34	1	0
Oregon	7	2	35	825	8	5	0	0
California	83	29	86	1,243	116	71	7	8
Total	707	676	2,805	23,270	15,934	4,287	106	158
First 2 weeks of year	1,401	1,353	5,228	35,415	29,082	8,243	201	301

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Jan. 15, 1938	Week ended Jan. 16, 1937	Week ended Jan. 15, 1938	Week ended Jan. 16, 1937	Week ended Jan. 15, 1938	Week ended Jan. 16, 1937	Week ended Jan. 15, 1938	Week ended Jan. 16, 1937	Week ended Jan. 15, 1938
New England States:									
Maine	0	0	16	16	0	0	1	4	57
New Hampshire	0	0	18	23	0	0	0	0	8
Vermont	0	0	8	3	0	0	0	0	24
Massachusetts	0	0	344	260	0	0	2	2	154
Rhode Island	0	0	32	60	0	0	0	0	33
Connecticut	1	0	86	77	0	0	0	0	39
Middle Atlantic States:									
New York	1	0	564	777	0	22	3	7	330
New Jersey	0	0	111	164	0	0	1	8	150
Pennsylvania	0	1	630	590	0	0	13	16	362
East North Central States:									
Ohio	2	5	544	433	9	20	3	6	144
Indiana	0	0	157	174	66	5	2	0	36
Illinois	1	0	707	513	79	14	5	8	100
Michigan	1	0	500	613	4	1	3	8	184
Wisconsin	1	1	203	288	5	9	0	0	182
West North Central States:									
Minnesota	0	1	134	184	95	18	1	1	55
Iowa	0	1	246	156	78	18	0	0	32
Missouri	0	0	286	193	50	60	34	0	95
North Dakota	0	0	39	35	12	27	0	0	14
South Dakota	0	0	26	79	2	21	0	0	6
Nebraska	0	0	44	67	1	3	3	0	6
Kansas	0	1	199	296	23	20	5	2	93
South Atlantic States:									
Delaware	0	0	19	9	0	0	0	0	7
Maryland [3]	0	0	49	104	0	0	2	1	45
District of Columbia	0	0	26	22	0	0	1	1	9
Virginia	0	0	27	50	0	1	2	7	108
West Virginia	0	0	87	60	0	0	2	2	108
North Carolina [3] [4]	0	1	49	68	0	0	4	7	324
South Carolina [3]	0	1	7	11	0	0	1	2	49
Georgia [3]	0	2	23	18	0	0	2	2	20
Florida [3]	1	0	12	6	0	0	3	1	10
East South Central States:									
Kentucky	1	0	61	54	34	2	0	9	14
Tennessee	1	0	35	32	2	0	7	5	26
Alabama [3]	1	0	15	10	0	0	1	2	29
Mississippi [3]	0	1	9	17	24	0	1	2	

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 15, 1938, and Jan. 16, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Jan. 15, 1938	Week ended Jan. 16, 1937	Week ended Jan. 15, 1938	Week ended Jan. 16, 1937	Week ended Jan. 15, 1938	Week ended Jan. 16, 1937	Week ended Jan. 15, 1938	Week ended Jan. 16, 1937	Week ended Jan. 15, 1938
West South Central States:									
Arkansas	2	1	23	18	0	0	0	2	48
Louisiana	1	1	28	7	0	1	4	9	6
Oklahoma [5]	0	2	50	27	2	8	1	2	12
Texas [3]	1	1	165	125	21	12	14	22	181
Mountain States:									
Montana	0	0	56	58	9	13	0	0	32
Idaho	0	1	29	19	58	15	1	0	11
Wyoming	0	0	10	14	2	1	0	0	10
Colorado	0	0	61	30	15	7	0	0	5
New Mexico	0	1	24	25	7	0	1	7	60
Arizona	0	0	11	11	0	0	0	2	37
Utah [2]	0	0	75	20	0	0	0	0	59
Pacific States:									
Washington	0	1	56	46	38	6	4	2	115
Oregon	0	0	67	63	20	12	3	0	13
California	2	3	218	355	71	4	0	5	456
Total	17	26	6, 186	6, 270	727	315	130	139	3, 893
First 2 weeks of year	37	47	11, 210	11, 437	1, 186	591	253	276	7, 520

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[1] New York City only.

[2] Week ended earlier than Saturday.

[3] Typhus fever, week ended Jan. 15, 1938, 25 cases, as follows: North Carolina, 3; South Carolina, 2; Georgia, 12; Florida, 2; Alabama, 2; Texas, 4.

[4] Rocky Mountain spotted fever, week ended Jan. 15, 1938, North Carolina, 1 case.

[5] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

[6] Exclusive of Denver.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
September 1937										
New Hampshire	0	--------	--------	--------	--------	--------	4	1	0	1
October 1937										
New Hampshire	0	1	--------	--------	--------	--------	8	11	0	3
November 1937										
New Hampshire	0	3	--------	--------	--------	--------	0	31	0	1
Puerto Rico	2	63	45	4, 791	56	--------	0	--------	0	83
December 1937										
Arkansas	4	88	548	135	198	9	6	145	11	20
Colorado	7	48	1	--------	343	--------	3	202	57	14
District of Columbia	3	49	14	--------	29	--------	0	59	0	4
Georgia	3	82	848	315	486	41	4	135	1	13
Idaho	0	8	17	--------	92	--------	2	125	109	5
Maine	1	4	3	--------	158	--------	1	149	0	6
Michigan	4	85	7	2	1, 508	--------	7	1, 897	3	10
Missouri	4	110	226	12	2, 786	--------	9	840	47	31
New Hampshire	--------	0	--------	--------	--------	--------	0	40	0	1
Tennessee	11	74	209	14	601	8	3	170	4	9
Vermont	0	2	--------	--------	536	--------	0	61	0	1
Wyoming	0	0	--------	--------	4	--------	0	61	30	--------

Summary of monthly reports from States—Continued

November 1937

Puerto Rico:	Cases
Chicken pox	31
Dysentery	39
Filariasis	3
Leprosy	1
Mumps	5
Puerperal septicemia	5
Tetanus	11
Tetanus, infantile	1
Whooping cough	73

December 1937

	Cases
Chicken pox:	
Arkansas	127
Colorado	603
District of Columbia	155
Georgia	186
Idaho	176
Maine	315
Michigan	2,179
Missouri	335
Tennessee	235
Vermont	335
Wyoming	96
Conjunctivitis:	
Georgia (infectious)	3
Idaho	6
Dysentery:	
Arkansas (bacillary)	5
Colorado	2
Georgia (amoebic)	9
Michigan (amoebic)	2
Michigan (bacillary)	1
Missouri	4
Tennessee (amoebic)	2
Tennessee (bacillary)	1
Encephalitis, epidemic or lethargic:	
Colorado	2
Idaho	1
Missouri	4
Tennessee	2
German measles:	
Arkansas	2
Maine	9

December 1937—Continued

German measles—Con.	Cases
Michigan	82
Tennessee	3
Hookworm disease:	
Arkansas	2
Georgia	1,650
Impetigo contagiosa:	
Tennessee	1
Mumps:	
Arkansas	26
Colorado	14
Georgia	90
Idaho	298
Maine	111
Michigan	659
Missouri	59
Tennessee	86
Vermont	537
Wyoming	23
Ophthalmia neonatorum:	
Arkansas	2
Tennessee	1
Paratyphoid fever:	
Michigan	6
Tennessee	1
Puerperal septicemia:	
Georgia	1
Tennessee	4
Rabies in animals:	
Michigan	6
Missouri	1
Rocky Mountain spotted fever:	
Idaho (delayed reports)	6
Septic sore throat:	
Arkansas	4
Georgia	49
Idaho	5
Michigan	30
Missouri	52
Tennessee	15
Tetanus:	
Georgia	4
Michigan	3
Tennessee	1

December 1937—Continued

Trachoma:	Cases
Arkansas	9
Idaho	1
Missouri	36
Trichinosis:	
Michigan	1
Tularaemia:	
Arkansas	2
Colorado	1
District of Columiba	1
Georgia	4
Michigan	4
Missouri	15
Tennessee	3
Typhus fever:	
Georgia	86
Tennessee	2
Undulant fever:	
Arkansas	2
Colorado	1
Georgia	2
Idaho	2
Maine	3
Michigan	10
Missouri	2
Vermont	5
Vincent's infection:	
Maine	16
Michigan	18
Tennessee	8
Whooping cough:	
Arkansas	120
Colorado	41
District of Columbia	28
Georgia	61
Idaho	101
Maine	138
Michigan	732
Missouri	190
Tennessee	116
Vermont	108
Wyoming	48

CASES OF VENEREAL DISEASES REPORTED FOR NOVEMBER, 1937

These reports are published monthly for the information of health officers in order to furnish current data as to the prevalence of the venereal diseases. The figures are taken from reports received from State and city health officers. They are preliminary and are therefore subject to correction. It is hoped that the publication of these reports will stimulate more complete reporting of these diseases.

Reports from States

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Alabama	1,339	4.63	276	0.95
Arizona	57	1.38	103	2.50
Arkansas	597	2.92	244	1.19
California	1,841	2.99	1,563	2.54
Colorado [1]	----------	----------	----------	----------
Connecticut	222	1.28	128	.74
Delaware	213	8.16	27	1.03
District of Columbia [1]	----------	----------	----------	----------
Florida [2]	1,994	11.94	246	1.47
Georgia	1,570	5.09	376	1.22
Idaho	46	.93	24	.49
Illinois	2,119	2.69	1,335	1.69
Indiana	300	.86	89	.26
Iowa [2]	293	1.15	171	.67
Kansas	185	.99	125	.67
Kentucky	487	1.67	255	.87
Louisiana	465	2.18	52	.24
Maine [2]	48	.56	50	.58
Maryland	935	5.57	326	1.94
Massachusetts	558	1.26	589	1.33
Michigan	897	1.86	681	1.41
Minnesota	207	1.12	282	1.06
Mississippi	1,927	9.53	2,338	11.56
Missouri	606	1.52	178	.45
Montana [2]	72	1.34	30	.56
Nebraska	104	.76	144	1.06
Nevada [3]	----------	----------	----------	----------
New Hampshire	13	.25	11	.22
New Jersey	779	1.79	300	.69
New Mexico	91	2.16	44	1.04
New York	10,242	7.90	2,355	1.82
North Carolina	2,618	7.50	706	2.02
North Dakota	42	.59	68	.96
Ohio	1,478	2.20	397	.59
Oklahoma	414	1.62	368	1.44
Oregon	127	1.24	271	2.64
Pennsylvania [4]	2,092	2.06	254	.25
Rhode Island	126	1.85	66	.97
South Carolina [1]	----------	----------	----------	----------
South Dakota	27	.39	21	.30
Tennessee	695	2.40	305	1.05
Texas	524	.85	290	.47
Utah	4	.08	18	.35
Vermont	24	.63	21	.55
Virginia	933	3.45	311	1.15
Washington	352	2.12	308	2.40
West Virginia [2]	293	1.57	109	.58
Wisconsin	53	.11	137	.47
Wyoming [5]	5	.21	1	.04
Total	38,104	3.03	16,083	1.28

See footnotes at end of table.

Reports from cities of 200,000 population or over

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Akron, Ohio[1]	--------	--------	--------	--------
Atlanta, Ga	224	7.80	144	5.02
Baltimore, Md	508	6.16	184	2.23
Birmingham, Ala	198	7.01	76	2.69
Boston, Mass	213	2.69	208	2.63
Buffalo, N. Y	167	2.82	104	1.76
Chicago, Ill	1,106	3.10	846	2.37
Cincinnati, Ohio[1]	--------	--------	--------	--------
Cleveland, Ohio	172	1.85	94	1.01
Columbus, Ohio	88	2.88	21	.69
Dallas, Tex	166	5.73	57	1.97
Dayton, Ohio	58	2.76	17	.81
Denver, Colo	41	1.38	22	.74
Detroit, Mich	420	2.43	844	1.09
Houston, Tex.[6]	162	4.84	61	1.82
Indianapolis, Ind	25	.66	36	.95
Jersey City, N. J.[1]	--------	--------	--------	--------
Kansas City, Mo	51	1.21	4	.09
Los Angeles, Calif	595	4.16	418	2.92
Louisville, Ky	172	5.31	114	3.52
Memphis, Tenn	162	6.07	58	2.17
Milwaukee, Wis.[1]	--------	--------	--------	--------
Minneapolis, Minn	72	1.48	107	2.20
Newark, N. J	351	7.57	115	2.48
New Orleans, La	50	1.04	33	.69
New York, N. Y	8,743	11.97	1,627	2.23
Oakland, Calif.[1]	--------	--------	--------	--------
Omaha, Nebr	45	2.04	53	2.41
Philadelphia, Pa	580	2.92	--------	--------
Pittsburgh, Pa	190	2.78	22	.32
Portland, Oreg	54	1.72	92	2.93
Providence, R. I	85	3.28	41	1.58
Rochester, N. Y	35	1.04	55	1.63
St. Louis, Mo	131	1.57	101	1.21
St. Paul, Minn	42	1.49	35	1.24
San Antonio, Tex	98	3.90	53	2.11
San Francisco, Calif	167	2.49	101	2.85
Seattle, Wash	125	3.29	121	3.19
Syracuse, N. Y	84	3.85	51	2.34
Toledo, Ohio	221	7.26	38	1.25
Washington, D. C.[1]	--------	--------	--------	--------

[1] No report for current month.
[2] Incomplete.
[3] Not reporting.
[4] Only cases of syphilis in the infectious stage are reported.
[5] From report submitted to medical director of epidemiological studies.
[6] Reported by Jefferson Davis Hospital.

WEEKLY REPORTS FROM CITIES

City reports for week ended Jan. 8, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	232	1,612	195	1,663	1,006	1,655	20	385	23	996	------
Current week [1]	166	241	75	3,713	866	1,481	49	360	26	1,010	------
Maine:											
Portland	1	------	0	3	1	3	0	0	0	16	27
New Hampshire:											
Concord	0	------	0	9	0	0	0	0	0	6	8
Manchester	0	------	2	0	1	6	0	0	0	0	16
Nashua	0	------	0	11	2	1	0	------	0	0	8
Vermont:											
Barre	0	------	0	16	0	4	0	0	0	0	5
Burlington	0	------	0	0	0	0	0	0	0	2	12
Rutland	0	------	0	0	0	0	0	0	0	0	9
Massachusetts:											
Boston	3	------	1	68	25	77	0	8	0	14	229
Fall River	1	------	1	0	6	1	0	2	0	10	32
Springfield	0	------	1	0	7	7	0	2	1	3	39
Worcester	0	------	0	2	6	8	0	0	0	12	44
Rhode Island:											
Pawtucket	0	------	0	0	0	7	0	0	0	0	16
Providence	0	------	1	0	10	23	0	1	0	31	83
Connecticut:											
Bridgeport	0	2	1	0	5	17	0	1	0	1	40
Hartford	1	1	0	1	9	16	0	0	0	5	39
New Haven	0	------	0	0	3	1	0	1	0	5	60
New York:											
Buffalo	0	------	0	3	10	21	0	7	0	14	155
New York	27	23	3	126	156	221	0	75	3	150	1,636
Rochester	0	------	0	4	5	10	0	2	0	1	72
Syracuse	0	------	0	0	9	9	0	1	0	8	61
New Jersey:											
Camden	2	1	1	35	5	3	0	1	0	0	41
Newark	1	3	1	1	9	9	0	4	0	36	116
Trenton	0	------	1	59	4	5	0	3	0	0	34
Pennsylvania:											
Philadelphia	6	6	2	128	43	105	0	17	3	20	544
Pittsburgh	2	5	3	476	39	45	0	13	0	28	228
Reading	0	------	0	2	6	6	0	1	0	0	36
Scranton	0	------	------	44	------	4	0	------	0	2	------
Ohio:											
Cincinnati	1	------	3	1	15	11	0	10	0	3	173
Cleveland	5	21	6	147	16	39	0	14	1	47	231
Columbus	0	------	0	40	6	9	0	5	0	2	117
Indiana:											
Anderson	0	------	0	0	0	6	5	1	0	8	10
Fort Wayne	1	------	0	21	8	3	0	1	0	0	------
Indianapolis	20	------	1	18	18	30	0	1	0	3	124
Muncie	0	------	1	29	8	2	2	0	0	0	29
South Bend	0	------	0	2	8	3	0	1	0	1	19
Terre Haute	3	------	0	5	0	2	0	0	1	0	23
Illinois:											
Alton	0	------	0	7	4	5	0	0	0	1	11
Chicago	12	13	5	710	46	218	1	27	1	41	774
Elgin	3	------	0	1	0	9	0	0	0	1	10
Moline	0	------	0	52	2	13	0	0	0	0	17
Springfield	0	------	0	47	3	12	0	0	0	1	17
Michigan:											
Detroit	9	------	4	282	30	118	0	20	0	52	322
Flint	0	------	0	2	5	32	0	2	0	22	36
Grand Rapids	0	------	0	1	2	28	0	0	0	9	34
Wisconsin:											
Kenosha	0	------	0	2	1	1	0	1	0	8	9
Madison	0	------	0	0	0	4	0	0	0	2	19
Milwaukee	2	2	2	334	12	23	0	1	0	18	106
Racine	0	------	0	2	0	7	0	0	0	2	9
Superior	0	------	0	0	0	2	2	2	0	0	11

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[1] Figures for St. Joseph, Mo., estimated; report not received.

City reports for week ended Jan. 8, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											8
Duluth	0	------	0	0	3	4	0	0	0	18	32
Minneapolis	0	------	0	1	3	23	0	1	0	7	93
St. Paul	0	------	0	5	8	9	27	2	0	9	76
Iowa:											
Cedar Rapids	1	------	------	0	------	3	0	------	0	1	------
Davenport	0	------	------	6	------	2	0	------	0	0	------
Des Moines	0	------	------	0	------	30	0	------	0	0	41
Sioux City	0	------	------	1	------	2	0	------	0	0	------
Waterloo	0	------	------	1	------	6	0	------	0	1	------
Missouri:											
Kansas City	1	------	1	68	22	33	0	3	0	1	105
St. Joseph	------	------	------	------	------	------	------	------	------	------	------
St. Louis	9	------	1	480	13	51	3	14	1	2	235
North Dakota:											
Fargo	0	------	0	0	1	6	0	0	0	2	13
Grand Forks	0	------	------	0	------	9	1	------	0	0	------
Minot	0	------	0	0	0	0	0	0	0	15	4
South Dakota:											
Aberdeen	10	------	------	0	------	0	0	------	0	3	------
Nebraska:											
Omaha	1	------	0	0	5	7	0	0	2	0	51
Kansas:											
Lawrence	0	1	0	0	0	0	0	0	0	10	1
Topeka	0	------	0	0	2	3	0	0	0	20	15
Wichita	0	------	0	1	4	2	0	0	0	4	35
Delaware:											
Wilmington	0	------	0	2	3	7	0	0	0	5	24
Maryland:											
Baltimore	7	7	1	6	21	15	0	7	1	30	221
Cumberland	0	------	0	0	1	2	0	1	0	0	17
Frederick	0	------	0	0	0	0	0	0	0	0	4
District of Columbia:											
Washington	6	2	2	14	19	20	0	11	0	17	179
Virginia:											
Lynchburg	0	------	1	0	6	0	0	0	0	5	19
Norfolk	0	------	0	0	2	4	0	1	0	0	26
Richmond	0	------	0	1	7	8	0	5	0	0	64
Roanoke	0	------	0	1	1	8	0	2	0	0	15
West Virginia:											
Charleston	0	4	0	9	10	1	0	3	0	1	37
Huntington	0	------	------	11	------	2	0	------	0	0	------
Wheeling	0	------	0	2	1	4	0	0	1	9	21
North Carolina:											
Gastonia	0	------	------	0	------	0	0	------	0	1	------
Raleigh	2	------	0	1	1	0	0	0	0	27	8
Wilmington	0	------	0	0	1	0	0	1	0	0	12
Winston-Salem	1	------	0	8	6	1	0	1	2	24	14
South Carolina:											
Charleston	1	48	0	32	5	0	0	0	1	0	22
Florence	0	------	0	0	2	0	0	0	0	0	9
Greenville	0	------	1	0	5	0	0	1	0	16	31
Georgia:											
Atlanta	3	37	4	103	17	7	0	6	0	7	107
Brunswick	0	------	0	0	2	0	0	0	0	0	6
Savannah	0	7	0	0	4	2	0	2	0	0	38
Florida:											
Miami	0	------	0	86	3	0	0	4	1	2	40
Tampa	1	8	3	1	2	1	0	2	0	0	20
Kentucky:											
Covington	1	------	0	0	3	4	0	1	0	0	14
Lexington	0	------	0	0	5	1	0	2	0	3	21
Louisville	2	3	0	154	9	11	0	3	0	8	92
Tennessee:											
Knoxville	2	4	0	5	1	5	0	0	0	1	------
Memphis	0	------	3	171	9	6	0	5	0	0	83
Nashville	2	------	0	8	10	0	0	3	0	2	77
Alabama:											
Birmingham	1	8	8	15	19	4	0	3	0	0	115
Mobile	0	------	3	2	3	0	0	0	0	0	31
Montgomery	0	5	------	5	------	0	0	------	0	1	------
Arkansas:											
Fort Smith	1	------	------	0	------	3	0	------	0	0	------
Little Rock	1	------	0	84	2	2	0	0	0	1	------

City reports for week ended Jan. 8, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	0	6
New Orleans	2	12	0	0	12	5	0	11	1	0	163
Shreveport	2	------	1	0	5	4	0	0	1	0	50
Oklahoma:											
Oklahoma City	1	------	0	0	6	8	0	2	0	0	48
Tulsa	6	------	------	0	------	8	2	------	0	8	------
Texas:											
Dallas	6	7	4	0	13	14	0	1	0	0	84
Fort Worth	5	------	1	0	4	11	0	1	0	5	54
Galveston	0	------	0	0	3	1	0	1	0	0	14
Houston	3	------	0	0	19	4	0	3	1	0	99
San Antonio	0	------	2	0	11	0	0	9	3	0	86
Montana:											
Billings	0	------	0	1	1	1	0	0	0	0	12
Great Falls	0	------	0	0	2	1	2	0	0	29	6
Helena	1	------	0	1	1	0	0	0	0	4	6
Missoula	0	------	0	0	1	0	0	0	0	0	7
Idaho:											
Boise	0	------	0	0	1	0	8	0	0	0	4
Colorado:											
Colorado Springs	0	------	0	1	1	3	0	1	0	1	11
Denver	4	------	0	142	9	11	0	2	0	4	96
Pueblo	0	------	0	0	1	0	1	1	0	0	7
Utah:											
Salt Lake City	0	------	0	3	2	16	0	1	0	5	21
Washington:											
Seattle	0	------	0	1	5	2	0	4	0	45	71
Spokane	0	------	0	0	1	2	0	1	0	15	42
Tacoma	0	------	1	0	2	4	2	0	0	10	30
Oregon:											
Portland	1	1	1	4	3	12	2	1	0	2	74
Salem	0	1	------	1	------	0	0	------	0	0	------
California:											
Los Angeles	14	8	3	8	25	40	3	12	1	17	391
Sacramento	0	21	0	0	5	4	0	5	0	52	48
San Francisco	0	4	0	0	10	11	0	13	1	65	217

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Boston	2	1	0
Connecticut:			
Bridgeport	1	0	0
New York:			
Buffalo	1	0	0
New York	3	0	0
Ohio:			
Cincinnati	1	0	1
Cleveland	2	0	0
Illinois:			
Chicago	2	0	1
Minnesota:			
Minneapolis	1	0	1
Nebraska:			
Omaha	0	0	1
Kansas:			
Topeka	0	1	0

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Maryland:			
Baltimore	1	1	0
District of Columbia:			
Washington	1	1	0
Kentucky:			
Louisville	1	1	0
Tennessee:			
Knoxville	1	0	0
Alabama:			
Birmingham	3	0	0
Oklahoma:			
Oklahoma City	1	0	0
Texas:			
Houston	1	1	0
Colorado:			
Denver	1	1	0
California:			
Los Angeles	1	0	1

Encephalitis, epidemic or lethargic.—Cases: Muncie, 1.
Pellagra.—Cases: Philadelphia, 1; Chicago, 1; Atlanta, 5; Savannah, 2; Mobile, 1; Dallas, 1.
Typhus fever.—Cases: Charleston, S. C., 2; Savannah, 1.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—2 weeks ended December 18, 1937.—During the 2 weeks ended December 18, 1937, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis				3	1					4
Chicken pox		2	1	268	547	170	72	17	136	1, 213
Diphtheria		9	12	130	17			3		171
Dysentery				1	2					3
Erysipelas				7	7	5	3	3	3	28
Influenza		6			18	12	1		10	47
Measles		32	13	224	498	11	95	58	131	1, 062
Mumps		3	4		100	27		5	40	179
Pneumonia		1			38		2		19	60
Poliomyelitis				3	7		8			18
Scarlet fever		12	2	219	192	55	75	50	39	644
Trachoma							2			2
Tuberculosis	2	4	15	86	96	9	2	2	22	238
Typhoid fever				96	7	6	8	1	4	122
Undulant fever				1	5		2		1	9
Whooping cough				274	125	48	9		66	522

CUBA

Provinces—Notifiable diseases—4 weeks ended December 11, 1937.—During the 4 weeks ended December 11, 1937, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer		1		13			14
Chicken pox			1				1
Diphtheria	2	7		5	1	1	16
Hookworm disease	2					1	3
Leprosy		3	1	2		1	7
Malaria	33	43	58	108	37	141	420
Measles	1	9	6				16
Poliomyelitis	1	3		4		3	11
Scarlet fever		2					2
Tuberculosis	7	23	33	57	4	26	150
Typhoid fever	15	17	6	33	8	30	109
Yaws						4	4

ITALY

Communicable diseases—4 weeks ended November 7, 1937.—During the 4 weeks ended November 7, 1937, cases of certain communicable diseases were reported in Italy as follows:

Disease	Oct. 11-17		Oct. 18-24		Oct. 25-31		Nov. 1-7	
	Cases	Communes affected	Cases	Communes affected	Cases	Communes affected	Cases	Communes affected
Anthrax	30	25	24	21	23	21	38	32
Cerebrospinal meningitis	10	10	6	6	9	8	10	8
Chicken pox	77	53	100	42	100	44	134	74
Diphtheria	779	387	773	378	721	337	786	375
Dysentery	45	28	44	24	34	24	28	18
Hookworm disease	30	12	17	9	8	8	28	10
Lethargic encephalitis	2	2	1	1	3	3	2	2
Measles	309	142	393	140	430	129	787	163
Mumps	73	46	96	47	60	39	79	50
Paratyphoid fever	148	109	124	93	121	79	112	85
Poliomyelitis	65	48	40	32	49	40	40	35
Puerperal fever	34	31	37	37	40	36	39	37
Scarlet fever	273	129	263	122	324	126	400	147
Typhoid fever	1,048	508	896	483	840	438	927	460
Undulant fever	42	30	35	32	31	26	34	28
Whooping cough	284	80	180	90	188	80	201	61

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following table must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths; P, present]

Place		May 30–June 26, 1937	June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Week ended—												
						October 1937					November 1937				December 1937			
						2	9	16	23	30	6	13	20	27	4	11	18	25
China:																		
Canton	C		62	80	102	3	7	4										
Hangchow	C				12		[1] 41											
Hoihow	C		100															
Hong Kong	C		7	964	680	24	29	13	14	4	4	1	1	1				
	D		7	497	344	26	16	4	13	4	3	1	3					
Kwangchow Wan	C			104		20	13	23	6		4	8						
	D			81		20			6		4	6						
Macao	C			286	190	9	12	6			1		1					
Manchuria:																		
Dairen	C					3	1	2										
Kwantung Leased Territory	C				3													
Mukden	C						2											
Nanking	C						[1] 63		[1] 42	15								
	D						[1] 8		[1] 6									
Shanghai	C			8	1,804	513	333	359	110	99	67	81	49	40	6	10	3	3
Swatow	C			8	24		13	9	11	11	24	19	42	16	2			
Tientsin	C					1	7											
Chosen: Fusan	C				1													
Dutch East Indies—Celebes	C				[2] 6													
Federated Malay States	D		2															
India	C	11,113	13,893	18,259	12,203	1,623	2,254	2,463	2,489	2,515	1,029	1,806						
	D	5,454	6,495	7,976	5,768	836	1,139	1,191	1,254	1,367	495	1,046						
Assam	C	435	63	35	44	13	6	3	12	25	13	39	19	16	6	68	40	25
	D	274	34	25	16	3	4	5	6	7	11	23	13	6	1	13	24	18
Bassein	C	6	1															
Bombay Presidency	C	1,713	2,936	4,273	3,366	391	430	311	130	113	122	106	104	31	49	42	53	
	D	674	1,098	1,719	1,571	202	212	153	63	56	51	50	53	17	28	19	35	
Bombay	C		[3] 1		[3] 1													
Calcutta	C	173	92	77	56	16	23	13	21	10	19	21	18	23	19	23	15	12
Central Provinces and Berar	C	318	62	176	286	154	214	177	211	104	79	93	102	82	36	27	19	31
Chittagong	C	34	5															

Delhi	C										1							
Madras Presidency	C	1,048	2,794	4,210	1,844	163	175		235	253	239	290	411	264	374		402	
	D	544	1,182	1,659	771	77	86		103	123	83	110	150	88	135		174	
Madras	C	6	16	64	70	17	15	35	23	16	32	61	44	96	52	29	30	49
	D	3	6	26	18	7	4	14	13	5	7	9	4	14	12	13	8	7
Negapatam	C	20		1	3			1										
	D	12	1		1													
Northwest Frontier Province	C			203	32	2	17											
Orissa Province	C	188	295	247	111	16	40	23	55	13	12	43	26	10	20	11	7	1
Punjab	C	16	24	120	29													
Rangoon	C	7												1				
Sind State	C			1	1													
Tuticorin	C	10																
India (French):																		
Chandernagor Territory	C	2	2				2			2	2	1	1					
Karikal Province	C				1													
Pondichery Province	C				1				1									
Indochina (French):[4]																		
Annam Province	C							4	1	32	173	191			40	18	31	5
Haiphong	C				56	120	204	169	68	16	16	12	10	6	1			
	D				30	75		2	82		18	9						
Hanoi	C					5	35	71	86	87	83	95	106	77	21	8	8	2
Tonkin Province	C				320	683	1,029	973	759	735	1,074	1,268			274	69	82	84
Japan:[5]																		
Hiroshima	C				32	5												
Kobe	C					1												
Okayama Prefecture	C						1	4										
Taku	C				1		3											
Tokuyama	C						10											
Tokyo	C						1											
Siam:																		
Bangkok	C	28	5	1				2										
Provinces	C	255	151	42	16	2	2	2	1									
Straits Settlements: Penang	C	1																

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[1] For 2 weeks. [2] El Tor strain. [3] Imported. [4] For reports prior to Apr 25, 1937, see previous issues of PUBLIC HEALTH REPORTS.

[5] A report states that up to Sept. 30, cholera was reported in Japan, as follows. Hiogo Prefecture, 1 case, 1 death; Hiroshima Prefecture, 40 cases, 14 deaths; Yamaguchi Prefecture, 2 cases, 1 death.

On vessels:

S. S. *Ellenga* at Penang from Negapatam	15 cases	June 2, 1937
S. S. *Aronda* at Rangoon from Calcutta	1 case	June 3, 1937
S. S. *Badahur* at Rangoon from Calcutta	1 case	June 11, 1937
S. S. *Talamba* at Port Swettenham from Madras	2 cases	June 27, 1937
S. S. *Chungking* at Bangkok from Hoihow	1 case	July 15, 1937
S. S. *Kwantung* at Hong Kong from Koihow	1 case	July 21, 1937
S. S. *Kiangsu*[6] at Singapore from Hong Kong	1 case	July 22, 1937
S. S. *Eagle* at Hong Kong from Kongmoon	1 case	July 27, 1937
S. S. *Muinam* at Singapore from Hong Kong	2 cases	Aug. 16, 1937
S. S. *Sandviken* at Kong Kong	Present	Aug. 18, 1937

On vessels—Continued.

S. S. *Haiching* at Hong Kong	Present	Aug. 18, 1937
S. S. *Talma* at Singapore from Hong Kong	1 case	Aug. 20, 1937
S S *Cremer* at Singapore from Amoy, Hong Kong, and Swatow	1 case	Aug. 24, 1937
S. S. *Tyndareus* at Kobe from Hong Kong and Dairen	1 case	Aug. 27, 1937
S. S. *Manila Maru* at Moji from Hong Kong	1 case	Aug. 31, 1937
S. S. *Anking* at Singapore from Hong Kong	1 case	Sept. 10, 1937
S. S. *Sphinx* at Singapore from Hong Kong	1 case	Sept. 15, 1937
S. S. *Kiungchow* at Hong Kong from Shanghai	3 cases	Oct. 3, 1937

[6] In addition, for week ended July 28, 3 cases with 2 deaths in contacts.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE[1]

[C indicates cases; D, deaths; P, present]

Place		May 30–June 26, 1937	June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Week ended—												
						October 1937					November 1937				December 1937			
						2	9	16	23	30	6	13	20	27	4	11	18	25
Algeria: Algiers	C	---	[2]1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Argentina. (See table below.)																		
Belgian Congo	C	---	---	---	---	---	---	---	---	[3]2	---	---	---	---	---	---	---	2
Bolivia. (See table below.)																		
Brazil. (See table below.)																		
British East Africa:																		
Kenya	C	24	42	15	11	10	1	1	1	2	7	---	3	---	---	---	---	---
Tanganyika	C	6	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Uganda	C	39	47	32	50	12	9	12	8	10	28	12	17	10	14	6	---	---
	D	53	43	32	48	12	---	12	7	9	23	12	14	10	12	---	---	---
Ceylon:																		
Central Province—Nuwara Eliya District	C	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3
Colombo	C	2	---	1	---	---	---	---	---	1	---	---	---	1	---	1	---	---
	D	2	---	1	---	---	---	---	---	1	---	---	---	1	---	1	---	---
Plague-infected rats		3	1	---	2	---	1	1	1	---	---	---	---	---	---	---	---	---
China:[4]																		
Fukien Province.[4]																		
Hsiatangchi.[4]																		
Manchuria.[4]																		
Dahomey. (See table below.)																		
Dutch East Indies:																		
Java and Madura	C	205	228	215	213	51	57	49	66	---	---	---	---	---	---	---	---	---
	D	205	224	215	212	51	55	48	66	---	---	---	---	---	---	---	---	---
Pasoeroean	C	---	1	---	---	---	---	---	---	---	3	---	1	---	---	---	---	---
Ecuador (see also table below):																		
Guayaquil	C	4	---	1	---	1	---	1	---	---	---	---	---	---	---	1	---	1
	D	3	1	1	---	1	---	---	1	---	---	---	---	---	---	1	---	---
Plague-infected rats		13	2	2	1	---	---	2	---	---	---	---	3	---	1	---	---	1
Parroquia Eloy Alfaro	C	---	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---
Egypt:																		
Asyut Province	C	1	---	---	---	---	---	---	---	---	1	---	---	---	---	---	---	---
Beheira Province	C	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1	---
Girga Province	C	1	---	---	---	---	---	---	---	1	---	---	---	---	---	---	---	---

Hawaii Territory:[5] Plague-infected rats:																		
Hawaii Island—Hamakua District:																		
Hamakua Mill Sector [5]				8	4		1			2			1	3	7			1
Honokaa Sector			3															
Paauhau Sector [5]		7	1	1	1					1		3		2				2
Paauilo															2	13	3	
Maui Island:																		
Makawao District—Plague-infected rats															1	3	2	
Omaopio					1													
Wailuku District—Puunene.[5]																		
India	C	316	558	962	1,697	421	334	320	310	611	465	364						
	D	203	356	522	747	157	158	129	144	233	187	188						
Bassein	C	6	1	2	2													
Plague-infected rats		2	1															
Bombay Presidency	C	24	33	43	62	17	18	13	11	23	20	11	16	12	15	10	10	
	D	9	20	25	42	13	10	12	4	9	9	11	8	8	17	8	4	
Central Provinces and Berar	C	7	10	85	285	31	121	96	48	286	120	84	183	205	109	147	80	54
Cochin	C				2						1							
Karachi	C				12													
Madras Presidency	C	6	106	203	111	13	20		30	17	43	45	74	13	23		16	
	D	3	63	98	59	8	8		14	11	20	23	28	13	13		5	
Punjab	C			17														
Rangoon	C		[4] 2	5														
Sind State	C				8													
Indochina (French) (see also table below):																		
Pnom-Penh	C	1																
Sadec	C		1		1													
Madagascar. (See table below.)																		
Peru. (See table below.)																		
Senegal.																		
Dakar	C	1	1		1													
Thies	C	4																
Tivaouane	C		1															
Siam	C					57												
	D					57												
Syria: Ras el Ain region	D	[7] 12																
Tunisia: Tunis	C		2															
Plague-infected rats			1														1	
Union of South Africa	C				[8] 1				[8] 1									

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[1] Including plague in the United States and its possessions.

[2] Suspected.

[3] Includes 1 case of pneumonic plague.

[4] Plague has been reported in China as follows· Information dated Aug. 18 reports an outbreak in West Hsingan (Khingan) and Southern Lungkiang Provinces. Under date of June 1, estimated deaths from plague in Fukien Province reported to be 3,000 to 4,000. According to a report dated May 10 several hundred deaths from bubonic plague occurred in Hsiatangchi. Information dated Sept. 2 states that 115 cases and 105 deaths occurred in Manchuria

[5] Plague has also been reported in Hawaii Territory as follows: Week ended Aug. 14, 1937, 1 lot of 5 rats and 1 lot of 3 mice, by mass inoculation; week ended Nov. 20, 10 rats by mass inoculation in Omaopio, Makawao District, Maui Island; week ended Jan. 1, 1938, 1 rat in Hamakua Mill Sector, week ended Jan. 8, 1 rat in Paauhau Sector, Hamakua District, Island of Hawaii; week ended Jan. 8, 1938, 1 death (human) in Puunene, Wailuku District, Maui Island.

[6] Imported.

[7] Pneumonic plague.

[8] For 2 weeks.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths; P, present]

Place	May 30-June 26, 1937	June 27-July 31, 1937	Aug. 1-28, 1937	Aug. 29-Sept. 25, 1937	Week ended—													
					October 1937					November 1937				December 1937				
					2	9	16	23	30	6	13	20	27	4	11	18	25
United States: [9]																	
California: [9] [10] [11]																	
Eldorado County — Plague-infected fleas.																	
Fresno County [10] C	--	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--
Plague-infected fleas.																	
Plague-infected ground squirrels	--	--	--	3	--	--	--	--	--	--	--	--	--	--	--	--	--
Placer County [11]—Plague-infected fleas.																	
San Bernardino County—Plague-infected fleas.																	
San Mateo County—Plague-infected fleas, lice, and ticks.																	
Idaho: [9] Bannock County—Plague-infected ground squirrels	([12])	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Montana:																	
Beaverhead County—Plague-infected ground squirrel	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Madison County — Plague-infected squirrels	--	--	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nevada: [9]																	
Douglas County C	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Plague-infected fleas.																	
Ormsby County — Plague-infected fleas and lice.																	
Oregon: [9] Wallowa County—Plague-infected ground squirrel	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Utah: [9]																	
Morgan County — Plague-infected fleas.																	
Wasatch County — Plague-infected ground squirrel	--	--	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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[9] Plague infection proved in insect hosts as follows: *California*—Eldorado County, Aug. 31; Fresno County, Oct. 7-Nov. 5; Placer County, June 22; San Bernardino County, July 12-Sept. 8; San Mateo County, July-Aug. 27. *Idaho*—Bannock County, July 8. *Nevada*—Douglas County, July 29-31; Ormsby County, July 2-Aug. 20 *Oregon*—Wallowa County, June 25. *Utah*—Morgan County, reported Aug. 10

[10] For 5 weeks ended Nov. 6, plague infection proved in pooled tissue from squirrels, chipmunks, and mice in Fresno County.

[11] For week ended Oct. 9, plague infection proved in pooled tissue from squirrels, chipmunks, and rats, and week ended Oct. 30, pooled tissue from squirrels, in Placer County.

[12] Number unspecified

Place		June 1937	July 1937	August 1937	September 1937	October 1937	November 1937
Argentina:							
Cordoba Province	C	-------	-------	-------	1	-------	-------
Mendoza Province	C	-------	[7] 9	-------	-------	-------	-------
Salta Province	C	-------	-------	[7] 1	-------	-------	-------
Santiago del Estero Province	C	-------	[7] 6	-------	-------	-------	-------
Bolivia La Paz Department	C	[7] 2	-------	-------	-------	-------	-------
Brazil Pernambuco State	C	-------	-------	5	-------	-------	5
Dahomey	C	1	-------	-------	-------	-------	-------
Indochina (French) (see also table above):							
Cambodia	C	4	2	-------	-------	-------	-------
Cochinchina	C	-------	2	-------	1	-------	-------
Madagascar (central region)	C	23	25	22	48	59	-------
	D	22	24	22	47	59	-------
Peru	C	4	7	3	5	9	12
Ancash Department	C	-------	-------	-------	-------	-------	3
Lambayeque Department	C	1	1	2	2	1	-------
Libertad Department	C	2	4	1	-------	2	1
Salaverry	C	-------	3	-------	-------	-------	-------
Lima Department	C	1	2	-------	3	6	8

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[7] Pneumonic plague.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX

[C indicates cases; D, deaths; P, present]

Place		May 30–June 26, 1937	June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Week ended—												
						October 1937					November 1937				December 1937			
						2	9	16	23	30	6	13	20	27	4	11	18	25
Algeria:																		
Algiers Department	C	2					1											
Oran Department	C	1																
Argentina. (See table below.)																		
Belgian Congo. (See table below.)																		
Bolivia. (See table below.)																		
Brazil:																		
Bahia (alastrim)	C	2	16	10	6	3												
Porto Alegre (alastrim)	D	1	2	2														
Recife (alastrim)	C				1													
Santos	C													1				
British East Africa:																		
Kenya	C		116															
Tanganyika	C	57	65	186	121						100	223						
Canada:																		
Alberta	C	[1] 1	5															
Quebec	C										[1] 1							
Saskatchewan	C			[1] 1														
China:																		
Amoy	C	1																
Canton	C											1						
Dairen	C	5	2	2														
Foochow	C	P	P	P	P		P		P		P		P					
Hangchow	C		1															
Hankow	C	4		1														
Hong Kong	C	7	9	82		1					1			5	4	2		7
Nanking	C	4																
Shanghai	C	18	29	2	1					1								
Swatow	C	2																
Tientsin	C	4																
Chosen. (See table below.)																		
Colombia (see also table below): Barranquilla	D	2	1			1				1								
Ecuador: Guayaquil	C	48	37	20	3	1		3	5	4	2			2		2		1
Egypt: Port Said	C	1	1															
Eritrea	C	3	2		28	52					9	7						

France. (See table below.)																		
Great Britain: England and Wales—																		
Chester County	C												1					
Greece: Salonika	C	5	24															
Guatemala. (See table below.)																		
India	C	9,247	6,578	3,026	1,738	318	437	249	375	377	336	466						
	D	2,725	1,875	910	461	87	108	44	113	77	70	99						
Assam	C	238	107	98	58	18	7	9	6	5	5	10	5	17	12	16	20	8
Bombay Presidency	C	536	331	177	181	23	61	24	39	17	5	49	35	41	102	83	205	
	D	129	106	53	38	5	12	5	7	4	3	17	9	12	27	28	51	
Bombay	C	105	104	25	47	11	17	3	4	6	5	23	26	19	50	43	66	110
	D	72	69	18	23	3	10	3	4	3	3	8	9	10	19	23	23	54
Calcutta	C	21	14	40	23	3	3	4	4	6	5	5	5	9	3	15	20	31
	D	19	10	16	17	2		3	4	5	1	3	4	5	2	11	13	17
Central Provinces and Berar	C	202	153	61	44	10	5	2	4	5	4		1	2	1		8	6
Chittagong	C	[2] 2	2															
Delhi	C		12	7				1								1	2	3
Karachi	C	5	2		[2] 2						[2] 1		1		[2] 1			3
Madras Presidency	C	130	462	415	318	67	64		96	77	68	67	50	30	30		30	
	D	31	104	95	62	16	11		13	11	7	3	12	4	6		5	
Madras	C	43	95	102	76	19	5	18	19	13	14	13	9	14	10	10	19	49
Moulmein	C	[2] 1																
Northwest Frontier Province	C	46	171	76	27	1	35	17	87	14	112	70	20	178	16	113	139	149
Orissa Province	C	457	462	310	117	30	62	27	36	38	40	81	35	50	63	94	69	127
Punjab	C	674	560	165	69	8	7	36	91	20	55	182	138	29	192	300	226	317
Rangoon	C	1		[2] 1				1		2			4	1		1		5
Sind State	C	254	279	209	96	31	10	17	8	12	19	41	68	36	75	79	52	230
Indochina (French) (see also table below):																		
Haiphong	C											2				4	21	11
Hanoi	C																	1
Pnom Penh	C	1																
Saigon-Cholon	C		1															
Tonkin Province	C																	26
Iran	C	2		3							2							
Teheran	C			1														
Iraq	C		2	5														
Italian Somaliland	C		1															
Japan: Osaka	C	[2] 1																
Mexico (see also table below):																		
Chihuahua	C		1		1													
Ciudad Juarez	D		1															
Durango	D	4	1			1												
Guadalajara	D	1																
Mazatlan	C	1	1															
Mexico, D. F.	C		10	8	6	1			4		5	5	1		2			
Monterrey	C		1	1	2								1		1			
San Luis Potosi	D					1												
Torreon	C	12	7	3	1											1		1
	D		11	7	3	1	1		1	2				4	1	2		4
Vera Cruz	C														1			

[1] For 2 weeks.

[2] Imported.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

(C indicates cases; D, deaths; P, present)

Place		May 30–June 26, 1937	June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Week ended—												
						October 1937					November 1937				December 1937			
						2	9	16	23	30	6	13	20	27	4	11	18	25
Morocco. (See table below.)																		
Nigeria	C	111	229	[2]71	11	6	10	--------	87	53	--------	29	--------	--------	--------	--------	--------	--------
Nyasaland	C	--------	1	12	--------	9	--------	--------	4	18	2	5	4	--------	--------	--------	--------	--------
Panama Canal Zone: Colon	C	--------	--------	--------	--------	2	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Portugal (see also table below):																		
Lisbon	C	6	6	1	5	2	--------	1	--------	--------	--------	1	1	1	--------	1	--------	1
Oporto	C	1	1	--------	2	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Senegal. (See table below.)																		
Siam: Tak Province	C	3	3	1	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Sierra Leone	C	1	--------	[2]5	--------	--------	[1]1	--------	[1]9	--------	--------	--------	--------	--------	--------	--------	--------	--------
Southern Rhodesia	C	--------	--------	--------	--------	4	--------	--------	--------	--------	--------	100	21	--------	--------	--------	--------	--------
Sudan (Anglo-Egyptian)	C	39	8	6	27	8	7	8	20	21	7	58	13	10	14	13	18	19
Tunisia	C	4	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Turkey. (See table below.)																		
Unfederated Malay States: Kedah	C	--------	P	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------
Uruguay	C	3	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------

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[1] For 2 weeks.

[2] For 4 weeks.

On vessels:

S. S. *Changte* at Thursday Island .... 1 case ...... June 26, 1937

S. S. *Empress of Japan* at Kobe from Manila .... 1 case ...... Aug. 11, 1937

S. S. *Northern Prince* at New York from Rio de Janeiro. 1 case ...... Aug. 19, 1937

On vessels—continued.

S. S. *Empress of Asia* at Honolulu .... 1 case ...... Sept. 5, 1937

S. S. *Castalia* at Suez from Karachi and Bombay .... 1 case ...... Oct. 5, 1937

S. S. *Lyra* at Rangoon from Calcutta .... 1 case ...... Nov. 16, 1937

Place		June 1937	July 1937	August 1937	September 1937	October 1937	November 1937
Argentina	C	-------	-------	-------	-------	3	1
Belgian Congo	C	-------	366	312	391	-------	-------
Bolivia: La Paz	C	-------	-------	-------	30	-------	-------
China: Manchuria—Harbin	C	-------	1	-------	-------	-------	-------
Chosen	C	1	-------	-------	-------	-------	-------
Colombia (see also table above)	C	108	-------	[4] 209	-------	-------	-------
France	C	-------	-------	-------	-------	-------	2
Guatemala	C	2	-------	1	-------	-------	-------
Indochina (French) (see also table above)	C	273	143	226	96	147	197
	D	50	30	63	12	28	43
Mexico (see also table above):							
Aguascalientes State	C	-------	-------	-------	5	-------	-------
Campeche State	C	-------	-------	-------	1	-------	-------
Chihuahua State	C	-------	-------	-------	4	-------	-------
Coahuila State	C	-------	-------	-------	2	-------	-------
Durango State	C	-------	-------	-------	15	-------	-------
Guanajuato State	C	-------	-------	-------	7	-------	-------
Hidalgo State	C	-------	-------	-------	1	-------	-------
Jalisco State	C	-------	-------	-------	5	-------	-------
Guadalajara	C	1	-------	-------	-------	-------	-------
Mexico State	C	-------	-------	-------	3	-------	-------
Mexico (see also table above—Con							
Mexico, D. F.	C	28	18	9	11	5	-------
Mexico City	D	-------	3	1	2	-------	-------
Michoacan State	C	-------	-------	4	37	-------	-------
Nayarit State	C	-------	-------	-------	1	-------	-------
Nuevo Leon State	C	-------	-------	-------	2	-------	-------
Monterrey	C	-------	1	-------	-------	-------	-------
Queretaro State	C	8	-------	1	5	1	-------
San Luis Potosi State—San Luis Potosi	C	1	-------	-------	-------	-------	-------
Sinaloa State	C	-------	-------	-------	3	-------	-------
Tabasco State	C	-------	-------	-------	1	-------	-------
Tlaxcala State	C	-------	-------	-------	3	-------	-------
Vera Cruz State	C	-------	-------	-------	2	1	-------
Yucatan State	C	-------	1	-------	-------	-------	-------
Zacatecas State	C	-------	-------	-------	1	-------	-------
Morocco	C	1	4	-------	1	1	2
Portugal (see also table above)	C	-------	-------	-------	61	-------	-------
	D	-------	-------	-------	8	-------	-------
Senegal	C	36	16	-------	-------	-------	-------
Turkey	C	1	-------	-------	-------	-------	-------

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[4] For July and August.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER

[C indicates cases; D, deaths; P, present]

Place		May 30–June 26, 1937	June 27–July 31, 1937	Aug. 1–28, 1937	Week ended—															
					September 1937				October 1937					November 1937				December 1937		
					4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18
Algeria:																				
Algiers Department	C	79	197	30	6	1				20	2		16	18		[1] 27	44		6	
Algiers	C	2	73	3									15							
Constantine Department	C	216	203	83	13	3		10	2	9	2		34	1		[1] 14	8	29	37	
Bone	C	11	15	4									1						1	
Constantine	C		22	7				2					7							
Philippeville	C		1										2				1			
Oran Department	C	26	16	7	4											[1] 13	3	2		
Southern Territories	C	9	4	1													2		1	
Basutoland	C			9				6				[2] 3								
Bolivia. (See table below.)																				
Bulgaria	C								12		1									
Chile	C	272	273		49	47	32	48	57			[1] 198								
Concepcion Province	C	1	32	16	3	2	2													
Iquique	C	2												1						
Linares Province	C		9	6	3	1		1	2											
Malleco Province	C		5	8	4	1	1													
Nuble Province	C		7	3				14	1											
Santiago Province	C	111	137	151	35	36	22	21	50			[2] 84								
Valparaiso	C	105	50	47	6	2	4	2	5	4	5		1		1	2	2	1		
China (see also table below):																				
Canton	C											1	2							
Dairen	C									1							2			
Hankow	C	1	1	1									2							
Shanghai	C	4	5		2															
Swatow	C		3																	
Tientsin	C	6	1	1		1	2					1		4						
Tsingtao	C		1																	
Chosen. (See table below.)																				
Czechoslovakia. (See table below.)																				
Egypt:																				
Alexandria	C	5	6	13	1	1	1	1		2	2			3	1	3		2		
Asyut Province	C	5	6	2								1								
Beheira Province	C	14	23	1																
Beni-Suef Province	C													1						
Cairo	C	1					1												1	
Dakahliya Province	C	15	31	3																

Damietta Province	C	2																		
Faiyum Province	C		1																	
Gharbiya Province	C	55	41																	
Girga Province	C	2	2																	
Giza Province	C		2																	
Minufiya Province	C	4	4																	
Minya Province	C			1																
Port Said	C	1	2																	
Qena Province	C	3																		
Sharkiya Province	C	3	1																	
Suez	C	1	2		1	1														
Provinces	C	307	130		9			1	1	1	1			2	4		1	1		4
Eritrea: Asmara	C	2	1												2					
Finland. (See table below.)																				
Germany: Frankfort-on-Main	C								1											
Great Britian—England and Wales—Gloucester County	C															1				
Greece. (See table below.)																				
Guatemala. (See table below.)																				
Hawaii Territory: Honolulu	C		4	1			2		2		2					1				1
Hungary	C		1																	
Iran	C	25					1													
Teheran	C	1																		
Iraq:																				
Baghdad	C	1	2																	
Kirkuk Province	C	12	2																	
Latvia. (See table below.)																				
Libya. (See table below.)																				
Lithuania. (See table below.)																				
Mexico (see also table below):																				
Chihuahua	C																2			
Mexico, D F	C		2	27	4	11	6	1	3	5	2	3	4	4	3	7	4	13		
San Luis Potosi	D	1																		
Torreon	C														1					
Morocco (see also table below)	C	174	85	21	6	7	3		1	17	11	7	2	1		6	22	18	58	102
Casablanca	C	200	5	5						4										4
Netherlands: Rotterdam	C																			[3] 1
Nigeria	C								2											
Palestine:																				
Haifa	C	1	3	4	4	3	4		3		7		6	3		2		3	3	2
Jaffa	C	3	3	9	4	5			1		6	5	1	2	5	4	6			2
Panama Canal Zone. (See table below.)																				
Poland	C	287	89	43	5	6	8	7	9	9	9	19	7	12	10	23	23	37	40	35
	D	20	1	4								1		2	1		2			
Portugal. (See table below.)																				
Rumania. (See table below.)																				
Straits Settlements: Singapore	C	1					1						1							
Switzerland			1							1										
Trans-Jordan	C		1												1					
Tunisia:																				
Tunis	C	19	4	10	5	1	1				2	1				3		1		
Provinces	C	545	337	216	12	14		50	1	38	24	40	29	23	29	63	46	11	34	

[1] For 2 weeks.

[2] For 3 weeks.

[3] Suspected.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER—Continued

[C indicates cases; D, deaths; P, present]

Place		May 30–June 26, 1937	June 27–July 31, 1937	Aug. 1–28, 1937	Week ended— September 1937: 4	11	18	25	October 1937: 2	9	16	23	30	November 1937: 6	13	20	27	December 1937: 4	11	18
Turkey. (See table below.)																				
Union of South Africa. (See table below.)																				
Yugoslavia: Belgrade	C	---	---	---	---	---	---	---	---	---	---	---	---	1	---	---	---	---	---	---

Place		June 1937	July 1937	August 1937	September 1937	October 1937	November 1937
Bolivia	C	35	---	---	---	---	---
China: Manchuria—Harbin	C	35	14	8	2	---	---
Chosen	C	85	---	---	---	---	---
Czechoslovakia	C	---	---	---	---	---	---
Finland	C	1	---	---	---	---	---
Greece	C	11	5	3	6	18	---
Guatemala	C	8	16	10	6	2	---
Latvia	C	---	---	---	1	---	---
Libya	C	34	10	---	---	---	---
Lithuania	C	2	7	---	2	6	7
Mexico (see also table above):							
Aguascalientes State	C	---	---	---	1	---	---
Campeche State	C	---	---	---	2	---	---
Durango State	C	---	---	---	1	---	---
Guanajuato State	C	---	3	---	19	---	---
Hidalgo State	C	2	---	3	4	---	---
Jalisco State	C	---	1	---	2	---	---
Mexico State	C	---	14	33	29	19	---
Mexico D. F	C	14	16	27	29	14	---
Mexico City	D	---	5	3	4	---	---
Mexico—Continued.							
Michoacan State	C	---	---	---	5	---	---
Puebla State	C	---	---	---	55	---	---
Queretaro State	C	2	---	2	3	2	---
San Luis Potosi State	C	---	---	---	6	4	---
Tamaulipas State	C	---	---	---	2	---	---
Tlaxcala State	C	---	---	---	3	---	---
Vera Cruz State	C	---	---	---	9	---	---
Zacatecas State	C	---	---	---	2	---	---
Morocco (see also table above)	C	182	88	25	16	39	47
Panama Canal Zone	C	---	---	1	1	---	---
Portugal	C	---	---	2	1	26	---
Rumania	C	177	61	26	31	33	---
Turkey	C	72	30	23	27	100	---
Istanbul	C	3	2	2	4	---	---
Union of South Africa:							
Cape Province	C	12	50	81	---	162	---
Natal	C	13	---	2	---	---	---
Orange Free State	C	35	11	2	---	3	---
Transvaal	C	3	13	---	---	5	---

YELLOW FEVER

[C indicates cases; D, deaths; P, present]

Place		May 30–June 26, 1937	June 27–July 31, 1937	Aug. 1–28, 1937	Week ended—																	
					September 1937				October 1937					November 1937				December 1937				Jan. 1, 1938
					4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25	
Brazil:																						
Amazonas State	D			1																		
Matto Grosso State [1]	D		1																			
Para State [1]	D		6	1			1															
Piauhy State	D	1																				
Colombia:																						
Boyaca Department	C	1	2	1																		
	D		4	2							1											
Caldas Department	D						1															
Cundinamarca Department	D	2	1	2		1	1															
Intendencia of Meta—Villavicencio	D							1														
Santander Department	C				2																	
	D		1	4			4	2	1				2						1		1	
Dahomey:																						
Bohicon	C	1																				
Cotonou	C																				[2] 1	
French Equatorial Africa:																						
Bangui	D						1															
Fort Archambault	C						[2] 2															
Libreville	C		1																			
	D		1																			
Gold Coast	C	11	23	9		3			1	1		1	1	[3] 7			[2] 1			2		[3] 5
	D	11	19	4		2			1					2			[2] 1			2		
Accra	C	2	2	1		[2] 1																
Keta	C																					1
Ivory Coast:																						
Agboville	C			1																		
Gaoua	C					2												[2] 1				
	D					1	[2] 1															
Touba	D							[2] 1		[2] 2												

---

[1] See also reports of yellow fever in Brazil on pp. 463, 536, 657, 683, 762, 818, 912, 1134, 1248, 1327, 1471, 1637, and 1691 of the PUBLIC HEALTH REPORTS for 1937.

[2] Suspected.

[3] Includes 1 suspected case.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER—Continued

[C indicates cases; D, deaths; P, present]

Place		May 30–June 26, 1937	June 27–July 31, 1937	Aug. 1–28, 1937	Week ended—																	
					September 1937				October 1937					November 1937				December 1937				Jan. 1, 1938
					4	11	18	25	2	9	16	23	30	6	13	20	27	4	11	18	25	
Nigeria:																						
Aba	C			1																		
Abeokuta	C					1																
Calabar (vicinity of)	C																					1
Enugu	C																				[2] 1	
Forcados	C		1																			
Ibadan	C		1									[2] 1										
Jos	C									2												
Maiduguri	C												[2] 1									
Makurdi	C										1											
Ogbomosho	C		5																			
	D		2																			
Ovim	C			3																		
	D		1																			
Sapele	C			1																		
Shendam	C							1														
Wana	C																2					
	D																1					
Paraguay [4]	C		P																			
Asuncion	C															1						
Senegal:																						
Bambey	C	[2] 1																				
Baol	C																			[2] 1		
Dakar	C									[5] 1				[6] 2								
Diakhao	C										1											
Diourbel	C				1													[2] 1				
	D			1																		
Gade	C													[2] 1								
Gossas	C			1				1		3												
Kaolakh	C												[2] 1	[2] 1								
Keur Moussa	C																1					
Louga	C																				1	
Rufisque	C								1		1				2							
Sebikotane	C													3								
	D													1								

Tamba-Counda	C			[2]1																		
Thies	C										2		2				1					
Thies Circle—Khombole	C													1								1
Sudan (French)	C																				1	
San	C														[2]1							
Toukoto	C																					

---

[2] Suspected.

[4] A dispatch dated June 4, 1937, from the United States legation in Asuncion, Paraguay, states that yellow fever has been officially reported in the northwestern part of Paraguay.

[5] Imported.

[6] Includes 1 suspected imported case.

X

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IN THIS ISSUE

Mortality From Certain Causes, First Nine Months of 1937
Birth and Death Rates by States for 1936 and Prior Years
Accuracy of Certified Causes of Death—Committee Report

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UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg. Gen ROBERT OLESEN, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PUBLIC HEALTH REPORTS

VOL. 53 FEBRUARY 4, 1938 NO. 5

MORTALITY FROM CERTAIN CAUSES DURING THE FIRST 9 MONTHS OF 1937[1]

The mortality rates presented in the accompanying table are based upon preliminary reports from the State departments of health of 39 States, the District of Columbia, and Hawaii. For 21 States and the District of Columbia comparative data are shown for the 3 immediately preceding years, 1934–36.

Because of lack of uniformity in the method of classifying deaths according to cause, and because a number of death certificates were not filed in time to be included, these mortality rates are preliminary and are intended to serve as an index of current mortality conditions only within the same area for which previous reports are available. The mortality rates of one State are not strictly comparable with those of another, owing to the varying practices in tabulation procedure in the different States and to the fact that crude rates are affected by differences in the age, sex, and racial characteristics of the populations concerned.

The low mortality rates recorded during the second quarter of 1937 continued throughout the third quarter so that the mortality from all causes, 11.1 per 1,000 population, for the first 9 months of 1937 was 6 percent less than that for the same period in 1936. This improvement in mortality conditions was shared in by 20 of the 26 States (including the District of Columbia) for which comparative data are available.

Only five causes or groups of causes of death show an increase over last year, viz, whooping cough, poliomyelitis, influenza, cancer, and diabetes. The increase in the death rate from cancer and diabetes was negligible (about 1 percent). Influenza, the other important cause with a higher death rate, took about 40 percent more lives than during the corresponding period of 1936.

Of the communicable diseases of childhood, whooping cough and poliomyelitis had death rates which were two and three times, respectively, the corresponding rates for the third quarter of 1936. The mortality from whooping cough has been fairly high since January 1937, but the excess mortality from poliomyelitis occurred only during the third quarter of the year.

---

[1] From the Division of Public Health Methods, National Institute of Health.

All of the other causes of death reported in table 1 show death rates which are lower than, or equal to, the corresponding rates reported in 1936. In addition, all of the important causes of death except heart disease, pneumonia, and cerebral hemorrhage have the lowest rates reported for the past 4 years.

The downward trend in the death rate from tuberculosis, which was practically checked in 1936, has continued during the first 9 months of 1937. The death rate for the current period, 50.7 per 100,000 population, is about 2 percent less than that for last year.

One of the most encouraging aspects of the current mortality record is the continued decline in the number of deaths associated with pregnancy and childbirth. The number of puerperal deaths per 1,000 live births is 15 percent less than the rate for 1936 and 23 percent less than the rate for 1934. If the last 3 months of 1937 have as favorable a record as the first 9, 1937 will be the ninth consecutive year in which a decline in maternal mortality has been recorded.

The infant mortality rate, 50 per 1,000 live births, is the lowest recorded for this group of States and represents a decline of 2 percent from 1936.

Present reports indicate that the birth rate for 1937 will be at least as large as it was in 1936. The rate for the current period is 16.0 per 1,000 population as compared with 15.9 for 1936.

Mortality from certain causes in the first 9 months of 1937, with comparative data for the corresponding period in preceding years

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths) per 1,000 population (annual basis)	Rate per 1,000 live births		Death rate per 100,000 population (annual basis)																			
			Total infant mortality	Maternal mortality	Typhoid fever (1, 2)	Measles (7)	Scarlet fever (8)	Whooping cough (9)	Diphtheria (10)	Influenza (11)	Acute poliomyelitis and polioencephalitis (16)	Encephalitis, epidemic or lethargic (17)	Epidemic cerebrospinal meningitis (18)	Tuberculosis, all forms (23–32)	Cancer, all forms (45–53)	Diabetes (59)	Cerebral hemorrhage, apoplexy (82a, b)	Diseases of the heart (90–95)	Pneumonia, all forms (107–109)	Diseases of the digestive system (115–129)	Diarrhea and enteritis under 2 years (119)	Nephritis (130–132)	All accidents (176–194, 201–214)[1]	Automobile accidents (206, 208, 210)[1]
22 STATES[2]																								
January–September:																								
1937	11.1	16.0	50	4.4	1.3	0.7	1.7	3.0	1.2	29.4	0.9	0.6	1.6	50.7	118.2	26.5	81.4	275.2	83.0	65.0	7.5	78.8	74.3	25.6
1936	11.4	15.9	51	5.2	1.5	.7	2.3	1.8	1.4	:0.9	.3	.6	2.4	51.6	116.2	26.4	88.7	278.0	88.4	67.5	7.7	82.6	------	------
1935	10.8	15.9	53	5.4	1.7	3.8	2.4	3.6	1.7	20.6	.7	.6	2.2	51.8	113.8	24.2	83.2	253.0	82.2	66.6	7.2	80.5	------	------
1934	11.0	15.8	58	5.7	2.2	4.8	2.1	4.6	1.7	14.4	.6	.7	.9	53.1	112.1	24.5	78.6	250.6	79.7	71.5	10.0	85.8	------	------
January–March:																								
1937	12.8	15.2	61	5.2	.6	.7	2.9	2.9	1.7	68.1	.2	.7	2.4	53.5	118.0	31.3	91.1	317.3	143.7	60.5	4.1	87.9	66.8	23.0
1936	12.6	15.5	57	5.8	.8	.8	3.6	2.0	2.0	36.0	.2	.6	3.4	53.0	115.9	30.7	98.6	314.6	142.1	62.6	4.8	92.7	------	------
1935	12.0	15.4	63	6.0	.8	4.8	3.2	3.6	2.3	43.6	.2	.6	2.4	53.9	111.4	27.5	91.0	283.0	127.1	63.3	4.2	87.8	------	------
1934	12.0	15.0	63	6.0	.9	5.7	3.3	3.9	2.4	27.2	.3	.6	.9	54.6	109.7	27.7	86.1	284.0	122.0	64.2	5.7	93.7	------	------
April–June:																								
1937	10.8	15.8	48	4.4	.8	1.1	1.8	2.6	1.0	17.1	.2	.6	1.6	52.0	117.9	25.1	81.2	272.6	72.4	63.7	6.5	80.7	72.4	24.0
1936	11.3	15.4	52	5.2	1.0	1.0	2.8	1.8	1.1	22.4	.1	.6	2.8	52.8	116.7	26.0	87.9	278.0	86.7	64.5	5.7	83.8	------	------
1935	11.0	15.6	53	5.5	1.2	6.0	3.0	4.8	1.4	14.1	.2	.8	2.8	54.2	116.5	23.8	84.5	258.3	84.2	67.3	7.5	82.9	------	------
1934	11.1	15.5	59	6.2	1.7	7.5	2.4	5.2	1.4	12.1	.4	.6	1.0	55.9	114.0	24.9	79.4	253.2	81.6	70.6	8.2	87.2	------	------
July–September:																								
1937	9.7	17.0	43	3.8	2.5	.4	.4	3.6	1.0	3.6	2.2	.6	.8	46.6	118.8	23.1	72.1	236.8	33.9	70.7	11.8	68.2	83.6	29.7
1936	10.3	16.7	45	4.7	2.6	.3	.7	1.7	1.1	4.5	.7	.6	1.1	49.1	116.1	22.7	79.6	241.8	36.9	75.5	12.5	71.5	------	------
1935	9.6	16.7	43	4.7	3.1	.7	.9	2.5	1.4	4.4	1.6	.6	1.4	47.6	113.8	21.4	74.5	218.4	36.4	69.1	9.9	71.0	------	------
1934	10.0	16.7	52	5.0	4.0	1.4	.8	4.8	1.4	4.4	1.0	.9	.6	48.8	112.5	21.1	70.4	215.5	36.4	79.5	16.0	76.6	------	------

[1] Data not compiled for these reports prior to 1937.

[2] States included are Connecticut, District of Columbia, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Maryland, Michigan, Minnesota, Montana, Nebraska, New Jersey, New York, Pennsylvania, Rhode Island, South Dakota, Tennessee, Virginia, and Wisconsin (estimated population July 1, 1937, 72,390,000). List includes all of the States with available data for the 4 years covered in this summary.

Mortality from certain causes in the first 9 months of 1937, with comparative data for the corresponding period in preceding years—Continued

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths) per 1,000 population (annual basis)	Rate per 1,000 live births		Death rate per 100,000 population (annual basis)																			
			Total infant mortality	Maternal mortality	Typhoid fever (1, 2)	Measles (7)	Scarlet fever (8)	Whooping cough (9)	Diphtheria (10)	Influenza (11)	Acute poliomyelitis and polioencephalitis (16)	Encephalitis, epidemic or lethargic (17)	Epidemic cerebrospinal meningitis (18)	Tuberculosis, all forms (23-32)	Cancer, all forms (45-53)	Diabetes (59)	Cerebral hemorrhage, apoplexy (82a, b)	Diseases of the heart (90-95)	Pneumonia, all forms (107-109)	Diseases of the digestive system (115-129)	Diarrhea and enteritis under 2 years (119)	Nephritis (130-132)	All accidents (176-194, 201-214)[1]	Automobile accidents (206, 208, 210)
JANUARY TO SEPTEMBER																								
Alabama:																								
1937	10.7	21.2	65	5.9	2.2	0.1	0.3	7.3	2.2	57.3	0.6	0.5	4.0	62.4	57.5	9.8	64.2	159.7	87.9	66.4	17.7	76.6	69.6	21.3
1936	10.9	21.6	66	6.5	2.7	.8	.4	2.9	2.8	56.9	1.3	.3	.8	65.5	57.8	12.5	66.6	146.6	104.0	61.7	17.9	78.7		
California:[3]																								
1937	14.3	14.6	54	4.4	.8	.9	1.0	5.4	1.9	37.7	.4	.6	2.6	82.4	141.0	29.1	91.2	408.8	111.1	82.2	7.8	89.7	105.3	47.0
1936	12.8	13.3	54	5.0	.9	4.3	2.1	1.8	1.9	18.4	.3	.5	2.8	80.9	141.3	25.6	89.6	349.9	81.9	79.3	7.3	86.7		
1935	12.4	13.0	51	4.7	1.0	1.7	1.2	.9	1.7	12.2	.4	.4	2.2	79.8	137.4	26.3	85.9	334.4	70.6	77.3	5.4	86.2		
Colorado:																								
1937	13.4	18.7	70	5.8	2.2	.2	2.4	5.5	2.5	61.1	4.4	1.2	3.7	68.1	116.4	16.0	86.1	212.4	184.5	84.1	23.2	80.1	97.5	35.5
Connecticut:																								
1937	10.2	12.9	41	3.0	.2	.8	.8	1.4	1.1	13.9	.4	.4	.8	38.1	125.1	31.5	84.8	231.3	69.8	47.3	3.3	79.2	69.3	22.3
1936	10.1	12.8	42	4.9	.2	.5	.7	1.7	.2	9.4	.2	.2	.9	38.3	124.8	27.2	(4)	230.5	73.6	(4)	3.0	87.0		
1935	10.2	12.7	44	4.6	.9	2.5	1.5	.9	1.0	8.8	1.2	.4	.9	42.0	125.5	31.4	(4)	220.2	69.1	(4)	1.9	86.6		
Delaware:																								
1937	13.6	15.8	69	5.1	2.6	1.5	(5)	8.2	.5	26.0	.5	(5)	2.0	59.7	114.3	27.0	104.1	351.6	103.6	80.1	9.2	137.3	110.2	39.3
District of Columbia																								
1937	13.8	19.2	63	6.0	1.4	2.7	.6	3.3	2.1	18.9	.6	.8	5.4	90.1	130.1	26.8	96.1	319.9	127.0	76.0	11.6	91.3	78.9	25.7
1936	14.7	18.8	67	6.2	1.3	1.5	.4	7.8	4.7	8.6	.4	.9	11.2	108.3	131.6	28.9	102.3	337.1	140.3	80.9	8.6	98.2		
1935	14.4	18.4	61	6.1	1.8	(5)	1.8	.2	3.4	12.6	1.8	1.1	16.9	106.9	126.3	26.6	97.0	330.2	130.1	95.9	11.0	100.8		
Florida:																								
1937	12.2	16.4	61	6.5	3.5	.2	.1	3.5	2.5	38.9	.2	.4	4.9	53.9	92.3	17.9	103.1	231.9	65.2	88.4	11.8	99.6	103.3	39.6
1936	12.5	15.9	59	7.6	2.8	.3	.1	1.6	2.3	56.7	.6	.5	3.1	53.6	84.0	18.4	100.6	235.2	84.8	84.0	8.5	105.2		
1935	12.0	15.9	64	7.9	4.1	2.3	.1	3.3	3.8	41.1	.5	.1	.5	54.1	85.7	18.9	92.6	207.2	62.9	90.5	14.1	104.7		
Georgia:																								
1937	10.5	19.4	63	7.2	4.7	.2	.3	4.8	2.6	48.3	.6	.2	1.2	50.1	55.1	11.4	80.5	162.2	85.6	69.1	17.3	103.9	72.6	27.8
1936	11.7	19.6	68	7.9	6.5	.2	.4	2.2	2.9	68.7	.6	.3	2.3	56.6	54.7	11.9	79.2	175.4	119.6	74.1	17.5	105.3		
1935	10.6	19.6	60	7.4	7.8	1.0	.6	5.8	3.2	46.7	.5	.2	.8	57.3	52.9	11.9	72.5	156.3	90.9	75.2	17.6	100.6		

Hawaii:																							
1937	8.3	20.1	70	4.9	1.8	55.2	(5)	1.2	3.3	8.4	.3	3.0	3.0	76.7	69.2	16.1	40.6	111.9	91.6	59.7	17.3	65.0	48.6	15.8
1936	7.9	19.9	71	3.8	2.1	(5)	(5)	.6	2.1	13.1	.3	.6	1.8	77.3	63.6	16.2	44.0	119.5	68.8	63.0	16.8	65.4	------	------
1935	7.7	21.7	67	4.6	1.9	(5)	(5)	3.1	.3	5.7	(5)	(5)	.9	74.2	62.3	15.7	44.7	101.3	62.0	62.9	19.8	68.3	------	------
Idaho:																							
1937	9.8	21.6	43	3.8	1.6	3.5	1.9	2.7	.8	47.4	.3	1.1	1.1	20.4	82.2	12.0	69.7	153.3	76.2	72.7	7.1	37.0	109.5	37.8
1936	10.5	20.8	45	3.4	2.2	1.9	12.4	1.9	.8	16.0	.6	1.1	6.9	26.2	76.8	13.5	73.5	181.2	98.9	66.1	5.8	25.1	------	------
1935	9.9	20.8	53	7.1	2.0	2.5	4.7	8.9	.3	17.3	.8	2.2	4.5	23.2	64.2	12.8	65.6	156.3	92.1	60.0	2.2	33.2	------	------
Illinois:																							
1937	11.2	14.2	45	4.1	.8	.2	2.3	2.1	2.0	20.8	1.2	.4	1.4	52.0	129.8	27.4	69.9	294.4	71.7	71.6	4.8	95.4	78.3	30.7
1936	11.9	14.0	48	4.4	.8	.2	3.5	2.0	2.4	14.0	.6	.5	2.5	52.5	131.6	29.0	79.0	314.3	78.6	72.6	6.3	103.0	------	------
1935	10.9	14.0	47	5.1	1.3	4.9	6.0	3.0	2.5	18.0	.4	.5	2.9	52.9	127.1	24.7	70.8	273.8	77.4	69.5	4.7	96.9	------	------
Indiana:																							
1937	11.2	14.4	53	3.8	1.3	.4	3.1	5.2	1.2	37.9	1.0	.5	1.8	46.1	107.6	14.8	117.7	241.6	92.0	(4)	9.2	63.4	84.7	37.7
1936	12.0	14.3	52	5.1	1.5	.2	3.4	1.7	2.7	30.7	.3	.7	2.1	48.8	107.9	17.2	130.6	269.9	100.3	(4)	8.4	77.4	102.9	32.5
1935	11.2	14.1	54	5.2	1.4	3.5	3.3	4.9	2.5	27.8	.2	.8	2.8	48.7	112.3	14.4	125.0	261.8	85.9	(4)	6.6	66.7	74.0	30.8
Iowa:																							
1937	9.8	15.7	43	4.7	.7	.1	4.2	3.5	.3	39.0	1.6	.7	1.0	21.0	124.2	20.8	101.6	216.8	64.5	56.1	4.3	59.4	52.2	20.5
1936	10.1	16.8	41	4.1	1.2	.1	3.3	1.5	.8	19.1	.2	.4	2.0	22.4	122.7	24.6	108.0	234.9	69.5	59.6	3.8	60.6	------	------
1935	10.4	15.6	50	5.5	1.4	8.0	2.4	1.9	1.9	24.1	.4	.7	1.9	26.3	126.4	20.8	104.3	226.1	79.1	62.0	4.3	61.9	------	------
Kansas:																							
1937	10.3	15.0	46	4.4	.7	.1	4.2	2.7	1.3	40.0	2.0	1.3	1.3	27.0	113.0	22.4	96.3	227.2	63.1	63.1	5.8	85.3	111.4	24.4
1936	11.8	15.6	53	6.0	1.7	.1	4.8	1.0	2.1	53.2	.7	1.1	1.3	30.7	115.7	22.5	106.1	245.6	86.8	74.2	6.4	100.8	------	------
1935	10.9	16.5	50	5.1	1.6	16.0	2.1	3.3	1.7	35.1	.3	1.6	2.3	28.7	111.2	21.8	97.0	213.0	84.9	72.6	6.2	92.3	------	------
Kentucky:																							
1937	10.2	20.1	51	4.0	5.3	3.5	1.4	7.8	3.4	57.3	1.2	.6	2.9	66.6	66.2	10.3	83.1	157.4	89.0	74.5	24.7	63.9	68.7	24.4
Louisiana:																							
1937	11.6	20.2	69	8.0	6.5	1.1	.7	7.6	2.8	62.2	.8	.4	1.4	72.3	79.9	16.6	67.4	203.8	101.9	75.7	17.7	101.6	68.9	20.9
1936	12.0	18.5	76	10.1	7.4	2.8	.3	5.0	3.6	55.1	.4	.1	2.1	73.6	76.7	17.6	70.5	196.4	117.5	80.6	17.1	106.7	------	------
1935	10.8	18.4	69	8.0	9.9	7.6	.6	2.9	4.5	24.3	.8	.4	.8	73.2	78.0	15.6	65.9	172.8	81.7	82.3	18.0	106.3	------	------
Maine:																							
1937	13.3	18.4	60	5.1	1.6	.3	.5	2.8	.5	45.0	2.0	.2	.8	31.7	148.3	22.8	123.0	364.1	98.3	58.2	13.2	83.7	67.1	15.7
Maryland:																							
1937	13.3	16.6	63	4.1	1.9	2.9	.8	6.3	1.4	19.0	1.3	1.6	3.2	86.0	132.2	27.2	110.6	308.5	111.9	72.2	15.1	140.6	92.4	29.7
1936	13.0	16.4	62	4.8	1.8	1.8	.7	4.3	1.3	11.7	(5)	1.0	8.6	82.4	127.8	27.4	112.0	301.4	110.3	66.0	10.9	141.6	------	------
1935	12.7	16.5	61	4.9	2.3	1.5	2.1	3.3	1.1	17.5	.2	1.0	5.2	82.3	129.1	26.3	111.1	269.2	105.3	73.3	14.6	136.0	------	------
Massachusetts:																							
1937	8.5	(4)	(4)	(4)	.2	.8	1.0	2.3	.3	11.4	.6	.3	1.8	40.9	146.5	33.9	94.1	357.3	100.6	61.9	3.0	71.0	63.5	17.1
Michigan:																							
1937	10.9	18.6	50	3.7	.7	.2	3.4	2.9	1.2	21.6	1.2	.2	1.0	45.5	114.0	25.6	86.6	271.4	86.3	67.0	5.8	61.0	91.6	38.7
1936	11.5	18.4	50	5.0	.7	.2	2.4	2.3	.8	12.7	.4	.4	1.3	44.4	116.0	26.1	94.9	279.9	87.7	76.0	9.3	64.1	------	------
1935	10.9	18.5	49	5.1	.7	5.1	2.2	2.9	.8	16.9	.7	.3	1.0	45.3	109.6	25.3	86.9	261.5	83.3	68.6	4.7	62.9	------	------
Minnesota:																							
1937	10.1	18.1	41	3.0	.3	.3	1.7	2.5	.4	29.9	1.6	1.0	1.1	35.1	139.7	23.4	86.8	229.0	97.4	56.6	2.8	45.1	74.2	22.1
1936	10.9	17.2	44	4.3	.6	1.1	5.1	1.0	.4	13.9	.2	.8	1.9	36.6	129.9	26.7	86.6	242.5	81.8	64.3	5.0	48.2	------	------
1935	10.0	16.6	48	4.8	.7	3.2	3.4	2.9	.5	17.7	.4	.8	1.8	35.8	131.0	22.2	83.3	209.1	77.0	64.1	4.0	47.6	------	------
Missouri:																							
1937	11.8	13.7	61	5.8	3.6	.4	2.9	4.4	1.9	43.4	1.4	1.0	1.3	57.4	120.4	22.8	93.3	261.6	123.2	62.8	10.4	102.1	80.2	26.1

[3] January to June.
[4] Data not available.
[5] No deaths.

Mortality from certain causes in the first 9 months of 1937, with comparative data for the corresponding period in preceding years—Continued

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths) per 1,000 population (annual basis)	Rate per 1,000 live births		Death rate per 100,000 population (annual basis)																			
			Total infant mortality	Maternal mortality	Typhoid fever (1, 2)	Measles (7)	Scarlet fever (8)	Whooping cough (9)	Diphtheria (10)	Influenza (11)	Acute poliomyelitis and polioencephalitis (16)	Encephalitis, epidemic or lethargic (17)	Epidemic cerebrospinal meningitis (18)	Tuberculosis, all forms (23-32)	Cancer, all forms (45-53)	Diabetes (59)	Cerebral hemorrhage, apoplexy (82a, b)	Diseases of the heart (90-95)	Pneumonia, all forms (107-109)	Diseases of the digestive system (115-129)	Diarrhea and enteritis under 2 years (119)	Nephritis (130-132)	All accidents (176-194, 201-214)[1]	Automobile accidents (203, 208, 210)
JANUARY TO SEPTEMBER—continued																								
Montana:																								
1937	11.8	19.5	50	3.9	2.8	0.5	2.5	2.8	2.0	69.0	1.2	.8	1.8	44.6	107.5	20.4	93.7	212.5	112.5	72.0	5.0	66.2	110.8	31.0
1936	11.6	19.6	50	5.0	1.5	.8	9.1	4.0	2.5	21.9	.2	.5	4.0	43.3	101.6	22.1	91.6	191.2	115.5	90.1	11.1	73.7	------	------
1935	11.7	18.9	56	4.3	1.8	11.8	2.5	5.3	3.0	44.6	.3	1.0	2.3	48.3	99.7	19.1	88.9	201.2	119.1	98.7	6.3	78.1	------	------
Nebraska:																								
1937	9.7	16.0	43	4.2	.5	.4	3.4	2.0	1.0	52.9	3.0	1.0	1.3	20.4	111.2	26.8	86.4	216.8	62.5	63.2	4.2	64.4	66.4	23.0
1936	10.2	17.0	44	5.9	.9	1.0	6.0	1.7	1.6	21.3	.8	.5	1.4	18.4	112.5	26.8	93.9	225.3	69.8	78.4	4.6	72.4	------	------
1935	9.8	16.7	43	5.6	.5	8.2	2.5	1.2	1.3	26.1	.3	.4	3.5	22.8	105.8	18.9	101.5	188.4	86.3	66.4	3.8	50.4	------	------
Nevada:																								
1937	12.6	15.0	49	8.8	(5)	(5)	2.6	2.6	(5)	11.9	(5)	(5)	(5)	74.1	71.5	11.9	82.1	242.2	127.1	58.2	4.0	41.0	166.8	50.9
New Jersey:																								
1937	10.1	12.6	40	3.3	.7	1.6	.4	1.2	.5	11.8	.5	.5	1.2	47.7	120.5	30.9	75.6	305.8	69.6	57.2	2.9	71.4	72.5	24.7
1936	10.2	12.4	44	3.9	.6	.4	.8	1.4	.3	7.8	.2	.8	2.0	51.0	123.0	30.6	80.3	294.7	68.9	58.4	3.6	76.5	------	------
1935	10.0	12.8	46	4.5	.6	1.7	.7	2.5	.9	10.6	.7	.6	.8	50.3	120.8	28.4	76.4	280.7	62.5	56.1	3.5	79.7	------	------
New York:																								
1937	12.0	14.6	46	4.0	.5	.6	.8	1.3	.7	11.9	.4	.7	1.3	59.6	149.6	37.5	68.4	361.7	93.1	69.0	6.2	76.7	72.2	21.7
1936	11.9	14.2	46	5.1	.6	1.3	1.7	1.0	.5	6.8	.1	.6	2.4	59.7	144.8	35.5	79.1	348.0	91.2	69.8	6.0	78.2	------	------
1935	11.6	14.4	49	5.2	.5	1.9	1.7	2.8	.8	7.7	1.2	.6	2.4	58.5	142.4	32.6	76.1	317.8	97.3	68.2	6.6	80.5	------	------
North Carolina:																								
1937	9.6	22.9	65	5.4	2.6	1.3	.8	4.7	2.8	29.4	.5	.5	1.1	55.7	52.7	10.4	77.3	156.4	83.5	72.6	26.6	83.6	69.7	27.3
1936	10.3	22.4	66	6.5	2.0	.2	.5	1.1	2.9	36.9	.5	.5	1.6	61.9	53.4	11.9	(4)	(4)	106.3	(4)	22.4	(4)	------	------
1935	9.8	23.3	68	6.7	2.3	2.7	.5	10.7	2.7	33.4	2.2	.3	.9	57.8	48.9	9.8	(4)	(4)	89.8	(4)	22.5	(4)	------	------
North Dakota:																								
1937	8.0	18.7	53	4.6	.2	(5)	1.3	.9	.8	34.5	(5)	.8	2.3	26.1	78.0	7.2	71.0	163.6	68.7	54.2	10.0	33.7	57.6	16.5
Ohio: [6]																								
1937	12.2	15.4	52	5.2	1.1	1.8	2.0	4.9	1.2	38.6	.8	1.0	1.8	52.9	119.0	27.1	110.9	286.7	92.4	69.1	8.2	81.2	96.8	36.8
1936	12.2	15.0	49	5.0	1.3	.9	2.5	2.3	1.2	21.8	.3	1.0	2.5	55.0	126.2	28.4	119.8	285.2	93.8	69.7	5.6	90.2	106.1	20.0

Oklahoma:																							
1937	8.7	16.2	59	8.0	4.9	1.3	1.3	2.7	2.5	48.9	2.4	.3	2.3	51.9	72.1	12.8	61.0	130.2	76.7	64.9	11.5	63.7	62.8	24.1
Oregon:																							
1937	12.2	15.2	42	3.8	.8	.1	1.0	2.3	.3	37.3	.6	.9	.6	35.6	120.5	22.0	105.8	278.7	67.8	53.2	1.2	106.5	91.7	31.0
Pennsylvania:																							
1937	11.2	16.0	51	4.2	1.0	.8	1.6	2.9	.9	31.0	.4	.7	1.4	47.5	115.8	30.8	78.2	297.3	77.7	56.4	6.2	85.0	62.2	20.2
1936	11.0	15.8	48	4.6	.8	.4	1.7	1.2	1.2	15.2	.2	.6	1.4	44.7	111.0	28.1	86.2	290.3	80.1	54.5	5.9	82.2	------	------
1935	10.6	16.1	51	5.1	.8	2.9	2.1	2.1	1.5	20.2	.3	.8	1.3	45.9	105.9	28.9	79.8	268.6	81.8	56.3	5.6	83.3	------	------
Rhode Island:																							
1937	12.4	15.2	48	3.6	.2	.6	1.8	2.9	.4	13.7	(5)	.4	2.7	47.7	157.6	42.6	97.6	369.5	101.7	59.9	4.5	111.7	53.2	17.9
1936	11.8	15.2	48	4.0	.2	.6	1.8	1.0	.2	11.0	(5)	.4	3.5	48.6	138.5	33.3	96.1	351.1	91.8	62.8	4.5	102.2	------	------
1935	11.5	15.3	48	4.0	.4	1.4	.4	1.2	1.0	10.0	4.3	.2	2.7	50.8	146.9	33.4	93.5	331.0	80.7	66.6	5.5	104.6	------	------
South Carolina:[6]																							
1937	10.4	19.2	87	8.4	6.8	1.0	.4	4.0	2.1	50.9	.6	.3	1.1	47.8	48.1	11.0	86.8	178.1	93.1	27.9	10.1	88.2	48.0	24.3
1936	10.8	19.1	84	8.5	7.1	.6	.4	3.3	2.1	60.0	.8	.2	3.3	52.2	45.4	10.4	96.1	176.6	116.9	36.7	9.0	90.0	------	------
1935	10.7	19.8	84	9.9	8.9	1.6	.2	10.8	1.7	54.4	.8	.9	1.5	53.1	44.9	10.7	94.2	177.7	87.0	35.8	8.2	92.7	------	------
South Dakota:																							
1937	9.1	16.8	53	4.4	.4	(5)	3.1	1.7	.6	48.5	.8	1.0	1.4	37.1	82.1	19.7	72.7	164.8	71.1	54.7	4.2	41.9	62.4	15.3
1936	9.2	19.1	47	4.3	2.1	.4	4.1	.6	1.0	21.8	(5)	.2	(5)	34.7	91.3	22.2	83.6	156.2	67.4	62.7	10.2	63.9	------	------
1935	9.2	19.3	51	6.3	1.5	5.4	1.7	4.6	1.2	36.5	1.2	.8	.4	40.8	87.3	20.1	78.8	138.5	101.8	60.3	7.0	58.5	------	------
Tennessee:																							
1937	10.2	16.6	64	6.8	4.7	1.0	.8	4.6	3.3	53.5	1.3	.6	2.6	83.7	65.8	10.7	76.5	155.7	91.7	76.7	19.7	63.6	65.7	22.6
1936	11.2	16.4	69	7.2	4.4	1.0	.7	2.4	3.0	61.7	1.4	1.0	4.2	90.2	62.4	11.6	79.0	160.8	120.0	80.7	19.9	68.3	------	------
1935	10.1	17.3	66	6.9	5.9	1.7	.6	16.4	3.9	42.4	.8	.5	4.0	83.7	64.1	11.2	74.6	138.6	89.2	75.2	20.0	61.3	------	------
Utah:																							
1937	9.5	24.1	39	3.6	1.0	.8	1.6	3.4	1.3	27.9	1.6	1.0	1.3	21.2	92.3	20.4	55.1	229.6	64.1	68.3	2.8	56.6	89.7	33.6
Vermont:																							
1937	11.2	14.5	48	8.9	1.4	(5)	.3	1.0	.7	37.0	.7	(5)	.7	50.6	138.2	21.6	112.8	322.9	98.4	52.7	3.5	72.3	67.7	15.4
Virginia:																							
1937	10.8	18.5	66	5.1	1.9	2.9	.3	8.8	2.3	44.8	.4	.7	4.6	62.2	71.6	15.4	87.3	219.2	98.6	54.7	14.3	83.3	67.1	26.0
1936	11.3	19.2	62	5.1	2.3	1.2	.4	4.3	2.4	40.7	.4	.4	5.7	67.5	70.2	15.7	95.5	233.6	92.6	55.6	9.9	93.4	------	------
1935	10.9	19.3	66	5.2	2.4	6.6	1.0	9.0	3.0	40.7	1.9	.6	3.9	71.2	71.3	15.1	93.1	210.5	79.3	57.4	12.3	86.9	------	------
Washington:																							
1937	11.5	14.8	40	5.1	.8	1.0	1.0	1.3	1.0	30.0	.5	2.0	1.4	47.5	130.8	23.9	103.2	296.4	70.6	54.8	2.3	75.0	97.5	31.5
1936	11.7	14.2	43	5.3	.8	2.7	1.6	.7	.2	28.9	.8	2.0	1.7	50.4	132.2	24.5	104.0	272.8	70.4	65.3	2.4	75.4	------	------
1935	11.2	14.0	44	5.7	.8	1.6	1.3	2.2	.8	17.1	.7	2.0	2.2	52.2	133.2	21.9	99.1	268.2	52.6	65.3	3.2	79.9	------	------
Wisconsin:																							
1937	11.2	18.1	44	5.0	.4	.1	2.6	1.8	.7	51.0	1.0	.5	.8	36.2	135.2	26.1	91.9	290.3	69.5	(4)	4.6	71.0	83.9	27.6
1936	11.5	17.8	47	4.1	.4	.5	5.1	1.6	.4	14.8	(5)	.6	1.0	37.0	133.6	29.1	100.7	291.5	72.4	(4)	6.0	71.3	------	------
1935	10.4	17.6	46	3.9	.2	3.2	4.0	1.9	.5	22.2	.2	1.0	1.4	37.7	129.4	25.7	89.4	252.4	64.5	(4)	4.9	69.4	------	------
Wyoming:																							
1937	10.9	19.3	54	3.8	.6	.6	5.1	5.1	(5)	58.8	4.0	1.7	2.8	18.8	73.7	9.1	82.8	261.1	125.1	74.8	14.3	31.4	136.0	53.7

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[4] Data not available.
[5] No deaths.
[6] January to August.

NATALITY AND MORTALITY DATA, BY STATES, FOR 1936 AND SUMMARIES FOR EACH YEAR SINCE THE ESTABLISHMENT OF THE BIRTH AND DEATH REGISTRATION AREAS

Table 1[1] presents the natality and mortality data for the United States by States, for 1936 and a comparison with 1935. The birth and death rates are births and deaths per 1,000 population.

The high death rates evidenced in Arizona, New Mexico, and Nevada are due, in large measure, to an excess in the number of nonresident deaths from tuberculosis; while those in the New England area result, for the most part, from the relatively advanced age of the population. The variations in the birth rates are due to a combination of biological and social factors, such as race, age of population, and fertility.

Table 2[1] gives a summary of the natality, general mortality, and infant mortality data for the birth and death registration areas for each year since 1920. Prior to 1933 the registration areas did not include all States, nor did the birth and death areas include the same group of States. For this reason the data for the two areas are tabulated separately.

Both the birth and the death rates have declined in the last 15 years; but especially worthy of note is the infant mortality rate, which has dropped almost one-third during that period.

TABLE 1.—*Summary of natality and mortality data for each State, 1935 and 1936*

Area	Estimated population July 1		Total births		Total deaths		Rate per 1,000 estimated population			
							Births		Deaths	
	1936	1935	1936	1935	1936	1935	1936	1935	1936	1935
United States	128,429,000	127,521,000	2,144,790	2,155,105	1,479,228	1,392,752	16.7	16.9	11.5	10.9
Alabama	2,864,000	2,834,000	60,116	62,239	31,153	28,585	21.0	22.0	10.9	10.1
Arizona	406,000	406,000	9,545	9,139	6,551	6,077	23.5	22.5	16.1	15.0
Arkansas	2,023,000	1,999,000	33,520	35,084	18,465	16,176	16.6	17.9	9.1	8.1
California	6 059,000	5,997,000	84,502	80,131	76,094	72,456	13.9	13.4	12.6	12.1
Colorado	1,063,000	1,062.000	18,279	18,837	13,674	13,134	17.1	17.7	12.8	12.4
Connecticut	1,734,000	1,717,000	22,225	22,258	17,858	17,659	12.8	13.0	10.3	10.8
Delaware	259,000	256,000	3,922	4,036	3,317	3,208	15.1	15.8	12.8	12.5
District of Columbia	619,000	594,000	11,704	10,803	9,094	8,483	18.9	18.2	14.7	14.3
Florida	1,642,000	1,614,000	28,097	28,051	20,953	20,046	17.1	17.4	12.8	12.4
Georgia	3,030,000	3,035,000	61,658	63,2[illegible]0	37,263	34,288	20.1	20.8	12 2	11.3
Idaho	485,000	479,000	10,224	9,468	5,014	4,531	21.1	19.8	10.3	9.5
Illinois	7,845,000	7,817,000	112,167	111,884	92,506	85,518	14.3	14.3	11.8	10.9
Indiana	3,459,000	3,429,000	54,034	52,909	42,470	39,515	15.6	15.4	12.3	11.5
Iowa	2,543,000	2,534,000	42,715	41,137	28,432	26,364	16.8	16.2	11.2	10.4
Kansas	1,886,000	1,878,000	29,998	30,589	21,674	20,334	15.9	16.3	11.5	10.8
Kentucky	2.883.000	2.846.000	55.778	57.715	32,378	29,870	19.3	20.3	11.2	10.8

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[1] Vital Statistics—Special Reports, vol. 5, No. 11, pp. 29 and 30. Bureau of the Census, Department of Commerce, Jan. 25, 1938.

TABLE 1.—*Summary of natality and mortality data for each State, 1935 and 1936*—Continued

Area	Estimated population July 1		Total births		Total deaths		Rate per 1,000 estimated population			
							Births		Deaths	
	1936	1935	1936	1935	1936	1935	1936	1935	1936	1935
Louisiana	2, 122, 000	2, 120, 000	43, 828	42, 270	25, 974	23, 711	20. 7	19. 9	12. 2	11. 2
Maine	853, 000	845, 000	15, 302	15, 723	11, 325	11, 024	17. 9	18. 6	13. 3	13. 0
Maryland	1, 674, 000	1, 669, 000	26, 583	27, 236	21, 960	21, 182	15. 9	16. 3	13. 1	12. 7
Massachusetts	4, 425, 000	4, 375, 000	61, 704	63, 001	52, 052	50, 237	13. 9	14. 4	11. 8	11. 5
Michigan	4, 783, 000	4, 731, 000	88, 427	87, 446	54, 781	51, 050	18. 5	18. 5	11. 5	10 8
Minnesota	2, 635, 000	2, 627, 000	47, 576	45, 962	28, 630	26, 247	18. 1	17. 5	10. 9	10. 0
Mississippi	2, 008, 000	2, 008, 000	49, 446	48, 320	24, 128	21, 339	24. 6	24. 1	12. 0	10. 6
Missouri	3, 959, 000	3, 913, 000	55, 916	57, 299	48, 767	43, 201	14. 1	14. 6	12. 3	11. 0
Montana	531, 000	531, 000	10, 400	10, 029	6, 255	6, 291	19. 6	18. 9	11. 8	11. 8
Nebraska	1, 364, 000	1, 364, 000	23, 798	23, 327	13, 752	13, 181	17. 4	17. 1	10. 1	9. 7
Nevada	100, 000	99, 000	1, 419	1, 423	1, 439	1, 324	14. 2	14. 4	14. 4	13. 4
New Hampshire	508, 000	502, 000	7, 679	7, 768	6, 438	6, 532	15. 1	15. 5	12. 7	13. 0
New Jersey	4, 328, 000	4, 288, 000	53, 833	54, 514	44, 959	43, 284	12. 4	12. 7	10. 4	10. 1
New Mexico	422, 000	422, 000	12, 907	13, 190	6, 248	6, 272	30. 6	31. 3	14. 8	14. 9
New York	12, 935, 000	12, 890, 000	182, 460	184, 344	153, 545	148, 462	14. 1	14. 3	11. 9	11. 5
North Carolina	3, 457, 000	3, 417, 000	76, 182	78, 753	35, 630	33, 485	22. 0	23. 0	10. 3	9. 8
North Dakota	703, 000	700, 000	13, 571	13, 655	5, 654	5, 860	19. 3	19. 5	8. 0	8. 4
Ohio	6, 713, 000	6, 707, 000	103, 703	101, 103	80, 941	77, 356	15. 4	15. 1	12. 1	11. 5
Oklahoma	2, 528, 000	2, 503, 000	41, 815	43, 691	23, 250	21, 091	16. 5	17. 4	9. 2	8. 4
Oregon	1, 017, 000	1, 008, 000	13, 975	13, 179	12, 367	11, 430	13. 7	13. 1	12. 2	11. 3
Pennsylvania	10, 136, 000	10, 067, 000	159, 393	161, 166	112, 711	108, 555	15. 7	16. 0	11. 1	10. 8
Rhode Island	681, 000	681, 000	10, 186	10, 215	8, 126	7, 838	15. 0	15. 0	11. 9	11. 5
South Carolina	1, 860, 000	1, 840, 000	39, 292	40, 598	21, 420	20, 353	21. 1	22. 1	11. 5	11. 1
South Dakota	692, 000	692, 000	12, 879	12, 850	6, 157	6, 316	18. 6	18. 6	8. 9	9. 1
Tennessee	2, 864, 000	2, 824, 000	50, 571	53, 314	32, 522	30, 002	17. 7	18. 9	11. 4	10. 6
Texas	6, 117, 000	6, 077, 000	111, 602	114, 721	65, 803	61, 663	18. 2	18. 9	10. 8	10. 1
Utah	516, 000	515, 000	12, 551	12, 695	5, 126	5, 066	24. 3	24. 7	9. 9	9. 8
Vermont	380, 000	377, 000	6, 449	6, 591	4, 957	4, 777	17. 0	17. 5	13. 0	12. 7
Virginia	2, 671, 000	2, 637, 000	51, 247	51, 487	32, 202	30, 358	19. 2	19. 5	12. 1	11. 5
Washington	1, 643, 000	1, 633, 000	23, 376	22, 306	19, 356	18, 203	14. 2	13. 7	11. 8	11. 1
West Virginia	1, 830, 000	1, 816, 000	40, 853	41, 774	19, 908	18, 340	22. 3	23. 0	10. 9	10. 1
Wisconsin	2, 908, 000	2, 908, 000	52, 613	52, 562	33, 242	30, 694	18. 1	18. 1	11. 4	10. 6
Wyoming	233, 000	232, 000	4, 753	4, 862	2, 401	2, 284	20. 4	18. 8	10. 3	9. 8

TABLE 2.—*Summary of natality, general mortality, and infant mortality data for the registration areas, 1921–36*

Year	Estimated population of United States	Birth registration area						Death registration area			
		Population		Births		Infant mortality	Births per 100 deaths	Population		Deaths	
		Number	Percent of total in United States	Number	Per 1,000 population			Number	Percent of total in United States	Number	Per 1,000 population
1936	128, 429, 000	128, 429, 000	100. 0	2, 144, 790	16. 7	57. 1	145	128, 429, 000	100. 0	1, 479, 228	11. 5
1935	127, 521, 000	127, 521, 000	100. 0	2, 155, 105	16. 9	55. 7	155	127, 521, 000	100. 0	1, 392, 752	10. 9
1934	126, 626, 000	126, 626, 000	100. 0	2, 167, 636	17. 1	60. 1	155	126, 626, 000	100. 0	1, 396, 903	11. 0
1933	125, 770, 000	125, 770, 000	100. 0	2, 081, 232	16. 6	58. 1	155	125, 770, 000	100. 0	1, 342, 106	10. 7
1932	124, 974, 000	119, 027, 000	95. 2	2, 074, 042	17. 4	57. 6	160	120, 291, 000	96. 3	1, 308, 529	10. 9
1931	124, 113, 000	117, 522, 000	94. 7	2, 112, 760	18. 0	61. 6	162	119, 479, 000	96. 3	1, 322, 587	11. 1
1930	123, 091, 000	116, 556, 000	94. 7	2, 203, 958	18. 9	64. 6	167	118, 472, 000	96. 2	1, 343, 356	11. 3
1929	121, 526, 429	115, 097, 972	94. 7	2, 169, 920	18. 9	67. 6	158	116, 317, 515	95. 7	1, 386, 363	11. 9
1928	119, 861, 607	113, 050, 663	94. 3	2, 233, 149	19. 8	68. 7	164	114, 258, 516	95. 3	1, 378, 675	12 1
1927	118, 196, 785	103, 575, 656	87. 6	2, 137, 836	20. 6	64. 6	182	108, 177, 538	91. 5	1, 236, 949	11. 4
1926	116, 531, 963	89, 682, 479	77. 0	1, 856, 068	20. 7	73. 3	170	104, 938, 301	90. 1	1, 285, 927	12. 3
1925	114, 867, 141	87, 486, 096	76. 2	1, 878, 880	21. 5	71. 7	182	102, 951, 999	89. 6	1, 219, 019	11. 8
1924	113, 202, 319	86, 256, 025	76. 2	1, 930, 614	22. 4	70. 8	192	100, 082, 062	88. 4	1, 173, 990	11. 7
1923	111, 537, 497	80, 694, 406	72. 3	1, 792, 646	22. 2	77. 1	181	97, 816, 104	87. 7	1, 193, 017	12. 2
1922	109, 872, 675	79, 415, 841	72. 3	1, 774, 911	22. 3	76. 2	189	93, 866, 240	85. 4	1, 101, 863	11. 7
1921	108, 207, 853	70, 738, 177	65. 4	1, 714, 261	24. 2	75. 6	208	89, 102, 434	82. 3	1, 032, 009	11. 6

Table 3 [2] presents a complete summary of annual mortality and natality data for the expanding death and birth registration areas covering the entire period since they were created.

The registration area for deaths was established by the Bureau of the Census in 1880, and in that year included only two States—Massachusetts and New Jersey—and certain cities in other States. Since, and including, 1933 the death registration area has comprised the entire continental United States.

Statistics for births in the United States, based on information obtained by the census enumerators for the decennial years, were collected and published for each census from 1850 to 1900; but the first annual report for the registration area for births was for 1915.

The summarized mortality data presented in table 3 are for the expanding death registration area by decennial periods for 1880 to 1900 and by single years for the period 1900 to 1936; the natality data are for the expanding birth registration area, by years, since 1915. The figures include, for each year, the numbers of births and deaths, the rates per 1,000 population, the number of States in each registration area, with the population and percentage of the total population, and the estimated total population of continental United States.

During the 56-year period, a half century which marks epochal developments in public health science and the application of its principles in the preservation of health and the prevention of disease, the gross death rate decreased approximately 50 percent. On the other hand, the birth rate decreased over 33 percent during the 21-year period 1915–36. However, applied public health science has lessened the effect of the declining birth rate with a compensatory saving of infant lives, and in the 15 years from 1921 to 1936 has reduced the mortality rate in children under 1 year of age from 75.6 to 57.1 per 1,000 live births, or more than 24 percent. The infant mortality rate is generally considered an excellent measure of public health work.

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[2] Vital Statistics—Special Reports, vol. 5, No. 6, p. 19. Bureau of the Census, Department of Commerce, Jan 18, 1938.

TABLE 3.—*Summary of annual mortality, natality, and other data covering the periods since the establishment of the registration areas*

Calendar year	Estimated population of continental United States	Death registration area in continental United States					Birth registration area in continental United States				
		Population		Deaths		Number of States	Population		Births		Number of States
		Number	Percent of total	Number	Rate per 1,000 population		Number	Percent of total	Number	Rate per 1,000 population	
1936	128,429,000	128,429,000	100.0	1,479,228	11.5	48	128,429,000	100.0	2,144,790	16.7	48
1935	127,521,000	127,521,000	100.0	1,392,752	10.9	48	127,521,000	100.0	2,155,105	16.9	48
1934	126,626,000	126,626,000	100.0	1,396,903	11.0	48	126,626,000	100.0	2,167,636	17.1	48
1933	125,770,000	125,770,000	100.0	1,342,106	10.7	48	125,770,000	100.0	2,081,232	16.5	48
1932	124,974,000	120,291,000	96.3	1,308,529	10.9	47	119,027,000	95.2	2,074,042	17.4	47
1931	124,113,000	119,479,000	96.3	1,322,587	11.1	47	117,522,000	94.7	2,112,760	18.0	46
1930	123,091,000	118,472,000	96.2	1,343,356	11.3	47	116,556,000	94.7	2,203,958	18.9	46
1929	121,526,429	116,317,515	95.7	1,386,363	11.9	46	115,097,972	94.7	2,169,920	18.9	46
1928	119,861,607	114,258,516	95.3	1,378,675	12.1	44	113,050,663	94.3	2,233,149	19.8	44
1927	118,196,785	108,177,568	91.5	1,236,949	11.4	42	103,575,656	87.6	2,137,836	20.6	40
1926	116,531,963	104,938,301	90.1	1,285,927	12.8	41	89,682,479	77.0	1,856,068	20.7	35
1925	114,867,141	102,951,999	89.6	1,219,019	11.8	40	87,486,096	76.2	1,878,880	21.5	33
1924	113,202,319	100,082,062	88.4	1,173,990	11.7	39	86,250,025	76.2	1,930,614	22.4	33
1923	111,537,497	97,816,104	87.7	1,193,017	12.2	38	80,694,406	72.3	1,792,646	22.2	30
1922	109,872,675	93,866,210	85.4	1,101,863	11.7	37	79,415,811	72.3	1,774,911	22.3	30
1921	108,207,853	89,102,434	82.3	1,032,009	11.6	34	70,738,177	65.4	1,714,261	24.2	27
1920	106,543,031	87,632,592	82.3	1,142,558	13.0	34	63,740,689	59.8	1,508,874	23.7	23
1919	105,003,065	85,166,043	81.1	1,096,436	12.9	33	61,483,423	58.6	1,373,438	22.3	22
1918	103,587,955	81,333,675	78.5	1,471,367	18.1	30	55,515,241	53.6	1,363,649	24.6	20
1917	102,172,845	74,984,498	73.4	1,068,932	14.3	27	54,771,416	53.6	1,353,792	24.7	20
1916	100,757,735	71,349,162	70.8	1,001,921	14.0	26	32,788,670	32.5	818,983	25.0	11
1915	99,342,625	67,095,681	67.5	909,155	13.6	25	30,936,179	31.1	776,304	25.1	10
1914	97,927,516	65,813,315	67.2	898,059	13.6	25					
1913	96,512,407	63,200,625	65.5	890,848	14.1	24					
1912	95,097,298	60,359,974	63.5	838,251	13.9	23					
1911	93,682,189	59,183,071	63.2	839,284	14.2	23					
1910	92,267,080	53,831,742	58.3	805,412	15.0	[1] 21					
1909	90,691,354	50,870,518	56.1	732,538	14.4	18					
1908	89,073,360	46,789,913	52.5	691,574	14.8	17					
1907	87,455,366	43,016,990	49.2	687,034	16.0	15					
1906	85,837,372	41,983,419	48.9	658,105	15.7	15					
1905	84,219,378	34,052,201	40.4	545,533	16.0	10					
1904	82,601,384	33,345,163	40.4	551,354	16.5	10					
1903	80,983,390	32,701,083	40.4	524,415	16.0	10					
1902	79,365,396	32,029,815	40.4	508,640	15.9	10					
1901	77,747,402	31,370,952	40.3	518,207	16.5	10					
1900	[2] 75,994,575	30,765,618	40.5	539,939	17.6	10					
Census Year											
1900	[2] 75,994,575	28,807,269	37.9	512,669	17.8	9					
1890	62,947,714	19,659,440	31.2	386,212	19.6	8					
1880	50,155,783	8,538,366	17.0	169,453	19.8	2					

[1] North Carolina is included, although returns were received only from municipalities of 1,000 population or more in 1900; the remainder of the State was added in 1916.
[2] Population for census year ending May 31.

NOTE.—For every year the District of Columbia was in both areas, but is not included in the "number of States"; the death area also included a varying number of registration cities in nonregistration States

THE ACCURACY OF CERTIFIED CAUSES OF DEATH

Recommendations of the Committee on the Accuracy of Certified Causes of Death of the American Public Health Association for the revision of the International List of Causes of Death in 1938, for consideration by the Mixed Commission, prepared and offered in response to the invitation of the Government of France.

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This report presents the recommendations of the Committee on the Accuracy of Certified Causes of Death, American Public Health Association, for the fifth decennial revision of the International List of Causes of Death. It has been formally approved by the Section on Vital Statistics of the Association, and will be presented to the International Conference for the Revision of the International List of Causes of Death at its forthcoming meeting in October 1938. It will be submitted for earlier consideration at the meeting of the Mixed Commission[1] in Paris, in the spring of 1938, when the recommendations of the various participating nations will be considered in connection with the preparation of the agenda for the International Conference.

The current report is the fifth made by the Committee. Prior reports have been published in the Public Health Reports and issued subsequently as separates (Reprints 363, 440, 1044, and 1706).

In the present report the Committee presents its recommendations as to the following:

(*a*) What titles of the fourth and latest revision (1929) should be continued in the International List?

(*b*) What terms should be listed under each title?

(*c*) What terms should be transferred from one title to another?

(*d*) What new titles should be established and what terms listed under each?

In spite of a considerable number of changes in the sequence and grouping of the titles, as recommended, comparability with previous mortality tabulations has been provided for by the addition of suitable subtitles.

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[1] Composed of members designated by the International Statistical Institute and the Health Section of the League of Nations.

It will be noted that all unscientific, inaccurate, indefinite, and obsolete terms have been omitted from the list of inclusions recommended under each title, although it is probable that such terms will have to be retained in the index which is always printed, for the convenience of registrars, in manuals of cause of death; but even in an index these terms should be indicated by some identifying sign as undesirable and not approved for medical usage. This will make it possible, when such terms are certified by physicians, to compile them uniformly under the titles which are most likely to relate to the conditions reported.

The recommendations of the Committee, if approved by the 1938 International Conference, will bring about a number of changes in the International List of Causes of Death. Among the more important are the following:

(*a*) The breaking up of Class I into 8 subclasses, as follows:

Diseases due to *bacteria;*
Diseases due to *spirochetes;*
Diseases due to, or believed to be due to *filtrable viruses;*
Diseases due to *rickettsia;*
Diseases due to *protozoa;*
Diseases due to *helminths;*
Diseases due to *fungi;*
Other infectious and parasitic diseases.

(*b*) The establishment of subtitles in the group relating to cardiac diseases, so that a separate statistical record may be made of cardiac lesions of rheumatic origin.

(*c*) The rearrangement of titles relating to nephritis in order to bring this group into closer agreement with modern pathological conceptions of kidney disease.

(*d*) A complete rearrangement of the group of titles relating to the puerperal state, designed to meet the needs of the finer analysis of puerperal mortality—a matter of increasing concern, both medically and socially.

I. INFECTIOUS AND PARASITIC DISEASES (1–51)

1–28: Diseases due to *bacteria.*
29–31: Diseases due to *spirochetes.*
32–42: Diseases due to, or believed to be due to *filtrable viruses.*
43: Diseases due to *rickettsia.*
44–46: Diseases due to *protozoa.*
47–49: Diseases due to *helminths.*
50: Diseases due to *fungi.*
51: Other infectious and parasitic diseases.

DISEASES DUE TO BACTERIA (1–28)

1. Typhoid fever

The approved terms are:

Enteric fever
Typhoid fever
Typhus abdominalis

2. Paratyphoid fevers

The approved terms are:

Paratyphoid fever (whether or not specified as to type A, B, or C)

3. Undulant fever (brucellosis)

The approved terms are:

Brucellosis
Febris melitensis
Malta fever
Mediterranean fever
Undulant fever

4. Scarlet fever

The approved terms are:

Nephritis following scarlet fever
Scarlatina
Scarlet fever
Any disease or condition qualified by the word *scarlatinal*

5. Whooping cough

The approved terms are:

Pertussis
Whooping cough

6. Diphtheria

The approved terms are:

Diphtheria (of any specified site)
of wound
Gangrenous diphtheria
Post-diphtheritic nephritis
Post-diphtheritic neuritis
Any disease or condition qualified by the word *diphtheritic*

7. Cholera

The approved terms are:

Asiatic cholera
Cholera (where Asiatic cholera is prevalent)
Epidemic cholera (where Asiatic cholera is prevalent)

8. Bacillary dysentery

The approved terms are:

Bacillary dysentery
Epidemic dysentery

9. Plague

The approved subtitles and terms are:

(*a*) **Bubonic**

Bubonic plague

(*b*) **Pneumonic**

Plague (pulmonary form)
Pneumonic plague

(*c*) **Septicemic**

Plague (septicemic form)

(*d*) **Unspecified**

Pest
Plague

10. Cerebrospinal fever (meningococcic meningitis)

The approved terms are:

- Cerebrospinal fever
- Epidemic cerebrospinal meningitis
- Meningococcus cerebrospinal meningitis
    - meningitis
    - septicemia

11. Glanders

The approved terms are:

- Equinia
- Farcy
- Glanders
- Infection by bacillus mallei
- Malleus sepsis

12. Anthrax (infection by bacillus anthracis)

The approved terms are:

- Anthrax
- Charbon
- Infection by bacillus anthracis
- Malignant pustule
- Woolsorters' disease

13. Tetanus

The approved terms are:

- Lockjaw
- Tetanus
- Tetanus neonatorum

14. Tuberculosis of the respiratory system

The approved terms are:

- Acute bronchopneumonic tuberculosis
- Chronic miliary tuberculosis of lung
- Miliary tuberculosis of lung
- Phthisis
- Pneumonic tuberculosis
- Pulmonary phthisis
    - tuberculosis
- Tuberculosis (of any specified part of the respiratory tract)
- Tuberculous laryngitis
    - phthisis
    - pneumonia

15. Tuberculosis of the meninges and central nervous system

The approved terms are:

- Solitary tubercle of brain
- Tuberculosis of meninges
    - any specified site of the meninges and central nervous system
- Tuberculous meningitis

16. Tuberculosis of the intestines and peritoneum

The approved terms are:

- Intestinal tuberculosis
- Tabes mesenterica
- Tuberculosis of intestine (any specified site of intestinal tract, peritoneum, and retroperitoneal lymph nodes)

17. Tuberculosis of the vertebral column

The approved terms are:

- Caries of spine
    - vertebra
- Lumbar abscess
- Pott's disease
- Psoas abscess
- Spinal caries
- Tuberculosis of spinal column
    - vertebra
- Tuberculous abscess of vertebra
    - caries of sacrum
    - lumbar abscess

18. Tuberculosis of the bones and joints (vertebral column excepted)

The approved subtitles and terms are:

(*a*) **Tuberculosis of the bones**

- Osseous tuberculosis
- Osteal tuberculosis
- Tuberculosis of bone (except vertebral column)
- Tuberculous osteomyelitis

(*b*) **Tuberculosis of the joints**

- Articular tuberculosis
- Tuberculosis of hip
    - joint (any joint)
- Tuberculous abscess of knee
    - arthritis
    - disease of hip
    - inflammation of knee
    - swelling of joint
    - synovitis

19. Tuberculosis of the skin and subcutaneous cellular tissue

The approved terms are:

- Scrofulide
- Tuberculide
- Tuberculosis of skin

20. Tuberculosis of the lymphatic system (bronchial, mesenteric, and retroperitoneal lymph nodes excepted)

The approved terms are:

General glandular tuberculosis
Lymphatic tuberculosis
Tuberculosis of axilla
Tuberculosis of any group of lymph nodes specified (bronchial, mesenteric, and retroperitoneal lymph nodes excepted)

21. Tuberculosis of the genito-urinary system

The approved terms are:

Tuberculosis (of any part of the genito-urinary system specified)

22. Tuberculosis of other organs

The approved terms are:

Tuberculosis (of any organ other than as specified in titles 14–21)

23. Disseminated tuberculosis

The approved subtitles and terms are:

(*a*) **Acute**

Acute general miliary tuberculosis
  miliary tuberculosis
General miliary tuberculosis
Miliary tuberculosis

(*b*) **Chronic**

Chronic general miliary tuberculosis
Chronic miliary tuberculosis

(*c*) **Unspecified**

Disseminated tuberculosis
General tuberculosis
General tuberculous infection
Generalized tuberculosis

24. Leprosy

The approved terms are:

Anesthetic leprosy
Leprosy
Leprosy (of any specified organ or part of the body)
Nodular leprosy

25. Gonococcic infection

The approved terms are:

Gonococcic arthritis
  endocarditis
  infection
  ophthalmia
  peritonitis
Gonococcus infection (of any part)
Gonorrhea
Gonorrheal disease (of any part)
Ophthalmia (due to gonococcus)
  neonatorum (due to gonococcus)

26. Erysipelas

The approved terms are:

Erysipelas neonatorum
  of any specified site
Surgical erysipelas

27. Generalized pyogenic infections

The approved terms are:

Aerogenes capsulatus infection
Bacteriemia
Gas bacillus infection
  gangrene
Purulent infection
Septicemia
Staphylococcemia
Staphylococcus infection
Streptococcemia
Streptococcus infection

28. Other bacterial diseases

The approved subtitles and terms are:

(*a*) **Streptococcus sore throat**

Septic sore throat
Streptococcus sore throat

(*b*) **Tularemia**

Tularemia

(*c*) **Other bacterial diseases not elsewhere specified**

DISEASES DUE TO SPIROCHETES (29–31)

29. Syphilis

The approved subtitles and terms are:

(*a*) **Congenital syphilis**

Congenital lues
syphilis
Hereditary lues
syphilis
Inherited syphilis
Lues infantum
Syphilis neonatorum

(*b*) **Syphilitic heart disease, including aortic aneurysm**

Aneurysm of aorta
Aortic aneurysm (except congenital)
Syphilitic heart disease

(*c*) **Syphilis of central nervous system other than general paralysis and tabes dorsalis**

Gumma of brain

(*d*) **Others under this title**

Acquired syphilis
Lues
Secondary syphilis
Syphilis (unqualified, or of any organ or part of the body)
Syphilitic (any affection)
Tertiary syphilis

For total deaths due to syphilis add also those under general paralysis (90) and tabes dorsalis (87).

30. Relapsing fever

The approved terms are:

Recurrent fever
Relapsing fever
(spirillum) fever

31. Other spirochetal diseases

The approved terms are:

Bronchopulmonary spirochetosis
Framboesia
Gangosa
Rat bite fever
Sodoku
Spirochetal hemorrhagic jaundice
jaundice
Vincent's angina
infection
Yaws

DISEASES DUE TO, OR BELIEVED DUE TO FILTRABLE VIRUSES (32–42)

32. Influenza

The approved subtitles and terms are:

(*a*) **With respiratory complications specified**

Bronchial influenza
Bronchopneumonia due to grippe
Influenza followed by pneumonia
Influenzal pneumonia
Pneumonia due to grippe

(*b*) **Without respiratory complications specified**

Grippe (unqualified)
Influenza (unqualified)
La Grippe

33. Yellow fever

The approved terms are:

Febris flava
Yellow fever

34. Smallpox (variola)

The approved terms are:

Hemorrhagic smallpox
Malignant smallpox
Smallpox
Variola

35. Chicken pox (varicella)

The approved terms are:

Chicken pox
Varicella

36. Measles (rubeola)

The approved terms are:

Hemorrhagic measles
Measles
Rubeola

37. German measles (rubella)

The approved terms are:

- German measles
- Roetheln
- Rubella

38. Mumps (parotitis)

The approved terms are:

- Epidemic parotitis
- Mumps
- Parotitis

39. Infectious encephalitis

The approved terms are:

- Epidemic encephalitis
- Lethargic encephalitis
- Sleeping sickness (lethargic encephalitis)

This title does not include: Trypanosomiasis (46); Postinfecticus encephalitis (51); Purulent encephalitis and noninfectious encephalitis (85); Traumatic encephalitis (194).

40. Acute poliomyelitis and acute polioencephalitis

The approved terms are:

- Acute anterior poliomyelitis
  - ascending anterior poliomyelitis
    - myelitis
    - poliomyelitis
    - spinal paralysis
  - infantile paralysis
- Acute polioencephalitis
  - polioencephalomyelitis
  - poliomyelitis
- Epidemic poliomyelitis
- Progressive ascending poliomyelitis

41. Rabies

The approved terms are:

- Bite of mad dog
- Hydrophobia
- Lyssa
- Rabies

42. Other diseases believed to be due to filtrable viruses

The approved terms are:

- Breakbone fever
- Cowpox
- Dengue
  - fever
- Herpes zoster
- Infectious warts
- Molluscum contagiosum
- Pappataci fever
- Phlebotomus fever
- Psittacosis
- Sandfly fever
- Shingles
- Vaccinia
- Zona

DISEASES DUE TO "RICKETTSIA" (43)

43. Diseases due to Rickettsia

The approved subtitles and terms are:

(*a*) **Typhus fever**

- Exanthematic typhus
- Japanese river fever (Tsutsugamushi fever)
- Mexican fever
  - typhus (tabardillo)
- Tabardillo (Mexican typhus)
- Trench fever
- Typhus fever

(*b*) **Rocky Mountain spotted fever**

DISEASES DUE TO PROTOZOA (44–46)

44. Protozoal dysentery

The approved subtitles and terms are:

(*a*) **Amebic dysentery**

- Amebiasis
- Amebic abscess of liver
  - dysentery
- Amebic enteritis
- Entamebic dysentery
- Tropical abscess of liver

(*b*) **Dysentery due to other protozoa**

- Balantidic dysentery

45. Malaria

The approved terms are:

- Blackwater fever
- Estivoautumnal fever
- Malaria
- Malarial fever
  - hemoglobinuria
- Malignant tertian malaria
- Paludism
- Quartan malaria
- Tertian malaria

46. Other diseases due to protozoal parasites

The approved terms are:

Coccidiosis
Flagellate diarrhea
Giardiasis
Infestation by *Giardia lamblia*
Kala-azar
Trypanosomiasis (Africana)
Americana (Chagas')

DISEASES DUE TO HELMINTHS (47–49)

47. Ankylostomiasis

The approved terms are:

Ankylostomiasis
Hook-worm anemia
disease
Infestation by ankylostoma ceylanicum
duodenale
Infestation by necator Americanus
uncinaria Americana
Necatoriasis
Uncinariasis

48. Hydatid disease

The approved subtitles and terms are:

(*a*) **Hydatid diseases of the liver**

Echinococcosis (site specified)
Echinococcus cyst of liver
Hydatid cyst of liver

(*b*) **Hydatid disease of other organs (specified site)**

Cysticercosis (site specified)
Hydatid (unqualified)
cyst (site specified)

49. Other diseases due to helminths

The approved terms are:

Ascariasis
Ascaris pneumonia
Bilharziasis
Chyluria
Clonorchiasis
Distomiasis
Elephantiasis (filarial)
Fascioliasis
Filariasis (of specified site)
Fluke disease
Galacturia
Helminthiasis
Hematochyluria
Infestation by ascaris lumbricoides
bothriocephalus latus
cestodes
cystorcus cellulosae
dibothriocephalus latus
diphyllobothrium latum
Infestation by fasciola hepatica
round worm
strongyloides stercoralis
taenia saginata (mediocanellata)
solium
tapeworm
termatodes
trichocephalus
dispar
trichuris trichiura
Lipemia
Lipuria
Paragonimiasis
Piarrhemia
Schistosomiasis
Taeniasis
Trichinosis
Tropical hematuria

DISEASES DUE TO FUNGI (50)

50. Fungi (Mycoses)

The approved terms are:

Actinomycosis (of specified site)
Aspergillosis (of specified site)
Blastomycosis (of specified site)
Coccidioidal granuloma
Discomycosis
Favus
Leptothricosis
Madura disease
foot
Moniliasis
Muguet
Mycetoma
Mycotic stomatitis
Pneumomycosis
Psilosis
Ringworm
Saccharomyces infection
Sporotrichosis
Stomatomycosis
Streptothricosis
Sycosis

51. Other infectious or parasitic diseases (origin uncertain)

The approved subtitles and terms are:

(*a*) **Dysentery (unqualified)**

Hemorrhagic dysentery

(*b*) **Venereal disease (other than syphilis and gonococcus infection)**

Granuloma inguinale
Lymphogranuloma venereum
Other venereal diseases

(c) Lymphadenoma (Hodgkin's disease)

Lymphadenia
Lymphadenoma of spleen
Lymphadenosis
Malignant lymphadenoma
Multiple lymphadenoma
Pseudoleukemia (Hodgkin's disease)

(d) Other infectious or parasitic diseases of unknown origin

Epidemic disease (not elsewhere included)
Epidemic hiccough
Foot and mouth disease
Miliary fever (sweating sickness)
Mycosis fungoides (of specified site)
Post-infectious encephalitis
Rhinoscleroma
Trachoma

II. CANCERS AND OTHER TUMORS (52–63)

52. Cancer of buccal cavity and pharynx

The approved terms are:

Cancer of buccal cavity (without further qualification)
cheek
gum
jaw
lip
maxilla (upper or lower)
mouth
Cancer of palate
pharynx
soft palate
tongue
tonsil
Epithelioma of lip

53. Cancer of digestive tract and peritoneum

The approved subtitles and terms are:

(a) Cancer of esophagus

Cancer of esophagus

(b) Cancer of stomach

Cancer of cardiac orifice of stomach
duodenum
Cancer of pylorus
stomach

(c) Cancer of rectum and anus

Cancer of anus
Cancer of rectum

(d) Cancer of liver and biliary passages

Cancer of bile duct
gall bladder
gall duct
Cancer of liver
Vater's ampulla

(e) Cancer of pancreas

Cancer of pancreas

(f) Cancer of peritoneum

Cancer of mesenteric gland
mesentery
omentum
peritoneum
Cancer of retrovaginal septum
retroperitoneal gland
retroperitoneal lymph nodes
Retroperitoneal cancer

(g) Cancer of intestines

Cancer of appendix
cecum
colon
ileocecal valve
ileum
Cancer of intestinal gland
intestine
jejunum
sigmoid flexure

(h) Other cancers of digestive tract

Cancer of abdominal viscera
Gastrointestinal cancer

54. Cancer of respiratory system

The approved subtitles and terms are:

(a) Cancer of larynx

Cancer of epiglottis
glottis
Cancer of larnyx
trachea

(b) Cancer of lung

Cancer of bronchi
lung
Pulmonary cancer

(c) Cancer of pleura

Cancer of mediastinal gland
mediastinum
Cancer of pleura

(d) Cancer of nasal cavity

Cancer of nasal cavity
Cancer of nasopharynx

55. Cancer of genital organs of the female

The approved subtitles and terms are:

(*a*) **Cancer of uterus**

- Cancer of cervix
  - uterus
  - womb
- Deciduoma malignum
- Syncytioma

(*b*) **Others under this title**

- Cancer of placenta

56. Cancer of genital organs of the male

The approved subtitles and terms are:

(*a*) **Cancer of the penis**

- Cancer of penis
- Cancer of prepuce

(*b*) **Cancers of other genital organs of the male**

- Cancer of epididymis
  - prostate
  - scrotum
- Cancer of seminal vessel
  - spermatic cord
  - testicle

57. Cancer of breast

The approved terms are:

- Cancer of breast
  - mammary gland
  - nipple
- Cancer en cuirasse
- Paget's disease of nipple

58. Cancer of urinary organs

The approved terms are:

- Cancer of bladder
  - kidney
  - ureter
  - urethra
- Embryonal carcinosarcoma of kidney
- Multiple new growth of kidney
- Renal cancer
- Rhabdomyosarcoma of kidney

59. Cancer of skin

The approved terms are:

- Cancer of (specified site of skin surface)
  - umbilicus
- Rodent ulcer
- X-ray cancer

60. Cancer of the brain and other parts of the nervous system

The approved subtitles and terms are:

(*a*) **All glioma unless stated to be nonmalignant**
(*b*) **Others under this title**

- Cancer of brain
  - cauda equina
  - cord (spine)
  - membrane of spinal cord
- Cancer of meninges
  - spinal cord
  - sympathetic nervous system

61. Cancer of other and unspecified organs

The approved subtitles and terms are:

(*a*) **Cancer of adrenal**

- Cancer of adrenal
- Cancer of suprarenal

(*b*) **Others under this title**

- Cancer of abdomen (without further qualification)
  - accessory sinus
  - antrum
  - antrum of Highmore
  - axilla
  - bone (except maxilla)
  - cervical node
  - chest
    - wall
  - choroid
  - eye
  - frontal sinus
  - groin
  - maxillary sinus
  - middle ear
  - orbit
- Cancer of parotid gland
  - pelvic viscera
  - pituitary body
  - spleen
  - submaxillary gland
  - thymus gland
  - thyroid gland
- Disseminated cancer
- General carcinomatosis
  - sarcomatosis
- Intraabdominal cancer
- Lymphosarcoma (of other or unspecified site)
- Malignant lymphoblastoma
- Miliary carcinosis
- Multiple cancer
- Sarcoma (of other or unspecified site)

62. Nonmalignant tumors (nature specified)

The approved subtitles and terms are:

(*a*) **Nonmalignant tumors of the ovary**

Dermoid cyst of ovary
Fibroid of ovary
Hematoma of ovary
New growth of ovary (nonmalignant)
Ovarian tumor
Papilloma of ovary
Tumor of ovary (nonmalignant)

(*b*) **Nonmalignant tumors of the uterus**

Deciduoma
Fibrocyst of uterus
Fibroid of body of uterus
uterus
tumor (when evidently referring to fibroid tumor of uterus)
Fibroma of uterus
Fibromyoma of uterus
Multiple fibroids
Myoma of uterus
New growth of uterus (nonmalignant)
Polypus of uterus
Submucous fibroid (female)
Tumor of uterus (nonmalignant)

(*c*) **Nonmalignant tumors of other female genital organs**

Hematoma of broad ligament
Nonmalignant new growth of uterine ligament
tumor of broad ligament
Fallopian tube
Nonmalignant tumor of uterine ligament
vagina
vulva

(*d*) **Nonmalignant tumors of the brain and cerebral meninges**

Basilar tumor (nonmalignant)
Cerebellar tumor (nonmalignant)
Cerebral glioma (nonmalignant)
tumor (nonmalignant)
Glioma of brain (nonmalignant
cerebellum (nonmalignant)
Intracranial tumor (nonmalignant)
Meningeal tumor (nonmalignant)
Nonmalignant new growth of brain
membrane of brain
Nonmalignant tumor of brain
corpora quadrigemina
meninges
motor tract
pons Varolii

(*e*) **Nonmalignant tumors of other organs**

Nonmalignant tumors of other organs, specified as to site and nature

63. Tumors of which nature is not specified

The approved subtitles and terms are:

(*a*) **Tumors of the ovary (nature unspecified)**

New growth of ovary
Ovarian tumor
Tumor of ovary

(*b*) **Tumors of the uterus (nature unspecified)**

New growth of uterus
Tumor of uterus

(*c*) **Tumors of other female genital organs (nature unspecified)**

New growth of uterine ligament
Tumor of broad ligament
Fallopian tube
Tumor of uterine ligament
vagina
vulva

(*d*) **Tumors of the brain (nature unspecified)**

Cerebellar tumor
Meningeal tumor
New growth of brain
membrane of brain
Tumor of brain (site specified)

(*e*) **Tumors of other organs (nature unspecified)**

Tumors of which the nature is unspecified, but the site is specified (except as included under subdivisions *(a), (b), (c),* and *(d)*).

III. RHEUMATISM, DISEASES OF NUTRITION AND OF THE ENDOCRINE GLANDS, AND OTHER GENERAL DISEASES (64–76)

64. Acute rheumatic fever

The approved subtitles and terms are:

(*a*) **Acute rheumatic pericarditis**

Acute rheumatic pericarditis
Rheumatic pericarditis

(*b*) **Acute rheumatic endocarditis**

Acute rheumatic endocarditis
Rheumatic carditis
Rheumatic endocarditis
pancarditis

(*c*) **Acute rheumatic myocarditis**

Acute rheumatic myocarditis
Rheumatic myocarditis

(*d*) **Others under this title**

Acute articular rheumatism
inflammatory rheumatism
rheumatic arthritis
Acute rheumatic fever
Rheumatic fever
pleurisy

65. Rheumatoid arthritis and other forms of chronic rheumatism

The approved subtitles and terms are:

(*a*) **Rheumatoid arthritis**

- Arthritis deformans
- Infectious arthritis (cause unknown)
- Primary progressive arthritis
- Proliferative arthritis
- Rheumatoid arthritis
- Still's disease

(*b*) **Other forms of chronic rheumatism**

- Atrophic arthritis
- Chronic arthritis
    - articular rheumatism
    - infectious arthritis
    - rheumatism
- Degenerative arthritis
- Hypertrophic arthritis
- Infectious spondylitis
- Multiple arthritis
- Osteoarthritis
- Polyarthritis (nonvertebral)
- Spondylitis deformans

66. Gout

The approved terms are:

- Gout of joint
- Gouty iritis
- Gouty synovitis
- Podagra

67. Diabetes mellitus

The approved terms are:

- Acidosis (diabetic)
- Diabetes mellitus
- Diabetic (any condition so qualified)
- Diabetic coma
    - gangrene
- Hyperglycemia

68. Scurvy

The approved terms are:

- Infantile scurvy
- Scorbutus
- Scurvy

69. Beriberi

The approved terms are:

- Beriberi
- Kakke

70. Pellagra

The approved terms are:

- Insanity of pellagra
- Pellagra

71. Rickets

The approved terms are.

- Rachitis
- Rickets

72. Diseases of the pituitary body

The approved terms are:

- Diabetes insipidus
- Dyspituitarism
- Gigantism
- Hyperpituitarism
- Hypopituitarism

73. Diseases of thyroid and parathyroid glands

The approved subtitles and terms are:

(*a*) **Simple goiter**

- Adenoma of thyroid gland
- Adenomatous goiter
- Colloid goiter
- Cystic goiter
- Enlargement of thyroid gland
- Nontoxic goiter

(*b*) **Exophthalmic goiter**

- Exophthalmic cachexia
    - goiter
- Hyperthyroidism
- Thyrotoxicosis
- Toxic adenoma of thyroid gland
    - goiter

(*c*) **Myxedema and cretinism**

- Cretinism
- Cretinoid degeneration
- Endemic cretinism
    - deaf-mutism
- Hypothyroidism
- Myxedema of thyroid gland
- Pachydermic cachexia

(*d*) **Other diseases of the thyroid gland**

- Abscess of thyroid gland
- Atrophy of thyroid gland
- Suppuration of thyroid gland

(e) Diseases of the parathyroid gland

Hyperparathyroidism
Hypoparathyroidism
Mollities ossium
Osteitis fibrosa cystica
Osteomalacia
Parathyroprival tetany

74. Diseases of the thymus gland

The approved terms are:

Atrophy of thymus gland
Enlargement of thymus gland
Hypertrophy of thymus gland
Inflammation of thymus gland
Lymphatism
Presistent thymus gland
Status lymphaticus
    thymicolymphaticus
    thymicus

75. Diseases of the adrenal bodies

The approved subtitles and terms are:

(a) Addison's disease

Addison's disease
Hypoadrenalism

(b) Other diseases of the adrenal bodies

76. Other general diseases

The approved terms are:

Acidosis
Acrodynia
Adiposis dolorosa
Amyloid disease (cause unknown)
Hemochromatosis
Milk sickness (trembles)
Ochronosis
Pentosuria
Sprue (not thrush)

IV. DISEASES OF THE BLOOD AND BLOOD-FORMING ORGANS (77–81)

77. Hemorrhagic conditions

The approved subtitles and terms are:

(a) Primary purpuras

Thrombocytopenia
Peliosis rheumatica
Purpura hemorrhagica
    rheumatica
Thrombocytopenic purpura

(b) Hemophilia

Bleeder
Hemophilia neonatorum

78. Anemias

The approved subtitles and terms are:

(a) Hyperchromic anemias

Pernicious anemia
Progressive anemia

(b) Hypochromic anemias

Anemias (secondary to acute or chronic blood loss)
Chlorosis
Simple anemia

(c) Other anemias

Aplastic anemia
Hemolytic anemia
Sickle cell anemia

79. Leukemias

The approved terms are:

Aleukemic leukemia
Leukemia
Leukocythemia
Lymphatic leukemia
Lymphochloroma
Lymphoid leukemia
Myeloid leukemia

80. Diseases of the spleen

The approved terms are:

Abscess of spleen
Enlargement of spleen
Infection of spleen
Melgaosplenia
Splenic anemia
Splenomegalia
Splenomegaly

81. Other diseases of the blood and blood-forming organs

The approved terms are:

Agranulocytosis
Granulocytopenia
Leucopenia
Malignant neutropenia
Polycythemia
Primary granulocytopenia

V. CHRONIC POISONING (82–84)

82. Alcoholism—Acute or chronic

The approved terms are:

- Acute alcoholism
  - ethylism
- Alcohol poisoning (ethyl)
- Alcoholic apoplexy
  - cerebral apoplexy
    - congestion
  - neuritis
  - paralysis
- Alcoholic polyneuritis
  - psychosis
- Chronic alcoholism
- Delirium tremens
- Dipsomania
- Ethylism
- Mania à potu
- Serous alcoholic meningitis

83. Lead poisoning

The approved subtitles and terms are:

(*a*) **Lead poisoning specified as occupational**

- Occupational lead poisoning
  - cachexia
  - colic
  - encephalitis
  - encephalopathy
  - paralysis
  - poisoning (chronic or unqualified)
- Morbus pictorum
- Painters' colic
- Plumbism
- Saturnine gout
  - nephritis
- Saturnism
- Tetra-ethyl-lead poisoning

(*b*) **Others or not specified as occupational**

84. Chronic poisoning by other organic or mineral substances

The approved subtitles and terms are:

(*a*) **Occupational**

Occupational poisoning by any organic or mineral substance

(*b*) **Others under this title**

Poisoning by any organic or mineral substance not occupational

VI. DISEASES OF THE NERVOUS SYSTEM AND SENSE ORGANS (85–95)

85. Purulent and noninfectious encephalitis

The approved terms are:

- Abscess of brain
  - cerebellum
  - pons Varolii
- Encephalitis (nonepidemic)
- Inflammation of brain
- Intracranial abscess
- Suppurative encephalitis

This title does not include: Infectious encephalitis (39); Trypanosomiasis (46); Postinfectious encephalitis, such as post-measles encephalitis (30) and post-vaccinal encephalitis (51); traumatic encephalitis (194).

86. Meningitis (not cerebrospinal fever)

The approved subtitles and terms are:

(*a*) **Simple meningitis**

- Cerebral meningitis
  - pachymeningitis
- Cervical pachymeningitis
- Chronic cerebrospinal meningitis
- Disseminated meningoencephalomyelitis
- External pachymeningitis
- Hemorrhagic internal pachymeningitis
  - pachymeningitis
- Internal pachymeningitis
- Pachymeningitis
- Pneumococcic cerebrospinal meningitis
  - meningitis
- Purulent meningitis
- Streptococcic cerebrospinal meningitis
- Suppurative cerebrospinal meningitis
  - external pachymeningitis
  - internal pachymeningitis
  - leptomeningitis
  - meningitis

(*b*) **Acute cerebrospinal meningitis (not of meningococcic origin)**

- Acute cerebrospinal meningitis (not meningococcic)
- Cerebrospinal meningitis (not meningococcic)

This title does not include meningococcic meningitis (10); tuberculous meningitis (15).

87. Tabes dorsalis (locomotor ataxia)

The approved terms are:

- Locomotor ataxia
- Tabes dorsalis

88. Other diseases of the medulla and spinal cord

The approved terms are:

- Acute ascending paralysis
- Amyotrophic lateral sclerosis
- Bulbar paralysis
- Chronic myelitis
- Combined sclerosis of spinal cord
- Disseminated myelitis
- Hematomyelia
- Hematomyelitis
- Hematorrhachis
- Hemorrhage of spinal cord
- Hereditary ataxia
  - sclerosis
  - spastic paraplegia
  - spinal ataxia
- Labioglossolaryngeal paralysis
- Labioglossopharyngeal paralysis
- Lateral sclerosis
- Myelitis from pressure
  - of spinal cord
- Polioencephalitis inferior
- Primary lateral sclerosis
- Progressive bulbar sclerosis
  - multiple paralysis
  - muscular atrophy
  - spinal amyotrophia
    - paralysis
- Pseudohypertrophic paralysis
- Spastic spinal paralysis
- Syringomyelia
- Transverse myelitis

89. Intracranial lesions of vascular origins

The approved subtitles and terms are:

(a) Cerebral hemorrhage

- Apoplectic stroke
- Apoplexy
  - of brain
    - meninges
- Bulbar apoplexy
  - hemorrhage
- Cerebral apoplexy
  - hemorrhage (age 1 month and over)
- Clot on brain
- Epidural hemorrhage
- Hemorrhage of brain (age 1 month and over)
- Hemorrhage of cerebellum
  - cerebrum
  - medulla
  - meninges
  - pons
- Intracranial hemorrhage (age 1 month and over)
- Paralytic shock
  - stroke
- Pontine hemorrhage
- Rupture of blood vessel in brain
- Ventricular hemorrhage

(b) Cerebral embolism and thrombosis

- Basilar embolism
  - thrombosis
- Cerebral embolism
  - infarction
- Cerebral thrombosis
- Sinus thrombosis
- Thrombosis of cavernous sinus
  - lateral sinus

(c) Softening of the brain

- Cerebral softening
- Encephalomalacia
- Softening of brain

(d) Hemiplegia and other paralysis, cause unspecified

- Congenital hemiplegia
- Hemiplegia
- Paraplegia

90. General paralysis (dementia paralytica)

The approved terms are:

- Chronic diffuse meningoencephalitis
- Dementia paralytica
- General paralysis (insane or reported from asylum)
  - paresis
  - tabetic paralysis
- Generalized paralysis (insane)
- Paralysis of insane
- Paretic dementia
- Progressive general paralysis
- Taboparesis

91. Dementia praecox and other psychoses

The approved subtitles and terms are:

(a) Dementia praecox

- Schizophrenia
- Paranoia

(b) Mental deficiency

- Dementia
- Primary dementia
- Terminal dementia.

(c) Others under this title

- Circular insanity
- Exhaustive psychosis
- Infective psychosis
- Manic depressive psychosis
- Toxic psychosis

92. Epilepsy

The approved terms are:

- Epilepsy
- Epileptic convulsions
  - dementia
  - psychosis
- Grand mal
- Idiopathic epilepsy
- Status epilepticus

93. Other diseases of the nervous system

The approved subtitles and terms are:

(*a*) **Neuralgia and neuritis**

- General neuritis
- Infectious neuritis
- Multiple neuritis
- Neuritis (any nerve)
- Peripheral neuritis
- Polyneuritis
- Tic douloureux
- Trigeminal neuralgia

(*b*) **Other diseases of the nervous system**

- Acquired hydrocephalus
- Acute hydrocephalus
- Amaurotic family idiocy
- Cerebral diplegia of children
- Chronic progressive chorea (Huntington's chorea)
- Idiopathic cortical seizure
- Infantile cerebral diplegia
  - paralysis
  - imbecility (not amaurotic family idiocy)
  - spastic paralysis
- Internal hydrocephalus
- Lobular cerebral sclerosis
- Lymphocytic choriocencephalitis
- Mongolism
- Myotonia congenita
- Paralysis
  - of diaphragm
    - phrenic nerve
    - pneumogastric nerve
- Paramyoclonus multiplex
- Polioencephalitis superior

94. Diseases of the eye and annexa

The approved terms are:

- Abscess of cornea
- Cataract (all forms)
- Glaucoma
- Ophthalmia (not gonococcic or specified as in the new-born)

95. Diseases of the ear and of the mastoid process

The approved subtitles and terms are:

(*a*) **Diseases of the ear**

- Acute suppurative otitis media
- Caries of middle ear
- Chronic suppurative otitis media
- Labyrinthine suppuration
  - vertigo
- Otitic meningitis
- Otitis externa
  - media
- Purulent otitis media
- Suppurative otitis media

(*b*) **Diseases of the mastoid process**

- Abscess of the mastoid process
- Acute suppurative mastoiditis
- Chronic suppurative mastoiditis
- Disease of mastoid cell
- Empyema of mastoid process
- Mastoid abscess
- Mastoiditis

VII. DISEASES OF THE CIRCULATORY SYSTEM (96–109)

96. Pericarditis

The approved subtitles and terms are:

(*a*) **Chronic rheumatic pericarditis**

- Chronic rheumatic pericarditis
- Rheumatic adherent pericardium
  - adhesive pericarditis
  - effusion of pericardium
- Rheumatic fibrinous pericarditis
  - hydropericardium
  - pericarditis with effusion

(*b*) **Other and unspecified forms of pericarditis**

- Hemopericardium
- Hydropneumopericardium
- Mediastinopericarditis
- Pneumopericarditis
- Purulent pericarditis
- Pyopericardium
- Pyopneumopericardium
- Suppurative pericarditis

97. Acute and subacute endocarditis

The approved subtitles and terms are:

(*a*) **Bacterial endocarditis (acute, sub-acute and unspecified)**

- Acute infectious endocarditis
  - ulcerative endocarditis
- Bacterial endocarditis (specify infecting organism)
- Malignant endocarditis
- Septic endocarditis
- Sub-acute bacterial endocarditis
- Ulcerative endocarditis
- Vegetative endocarditis

(*b*) **Acute endocarditis (unqualified)**

- Acute endocarditis
- Acute valvular endocarditis

(*c*) **Endocarditis unspecified (under 45 years)**

- Endocarditis (under 45 years)
- Endopericarditis (under 45 years)
- Periendocarditis (under 45 years)

The Committee recommends the retention of this subtitle in the interests of comparability with previous years.

98. Chronic endocarditis and valvular diseases

The approved subtitles and terms are:

(*a*) **Endocarditis (specified as chronic) and other valvular diseases**

- Aortic incompetency
  - insufficiency
  - obstruction
  - regurgitation
  - stenosis
  - valvular disease of heart
- Atheroma of valve of heart
- Chronic endocarditis
  - mitral endocarditis
  - valvular endocarditis
    - heart disease
- Incompetency of aortic valve
  - mitral valve
  - tricuspid valve
- Insufficiency of aortic valve
  - mitral valve
  - tricuspid valve
- Mitral incompetency
  - insufficiency
  - obstruction
  - regurgitation
  - stenosis
  - valvular disease of heart
- Pulmonary stenosis
  - valvular disease of heart
- Tricuspid incompetency
  - insufficiency
  - regurgitation
  - stenosis
  - valvular disease of heart
- Valvular disease of heart

(*b*) **Endocarditis, unspecified (45 years and over)**

- Endocarditis (45 years and over)
- Endopericarditis (45 years and over)
- Periendocarditis (45 years and over)
- Vegetative endocarditis (45 years and over)

The Committee recommends the retention of this subtitle in the interest of comparability with previous years.

(*c*) **Chronic rheumatic valvular disease**

- Any chronic endocarditis or valvular disease specified as rheumatic
- Chronic rheumatic endocarditis

99. Myocarditis and myocardial degeneration (not specified as arteriosclerotic or due to coronary artery disease)

The approved subtitles and terms are:

(*a*) **Acute myocarditis**

- Acute interstitial myocarditis
- Acute myocarditis

(*b*) **Chronic rheumatic myocarditis**

- Chronic rheumatic myocarditis

(*c*) **Chronic myocarditis and myocardial degeneration**

- Chronic interstitial myocarditis
  - myocarditis
- Fatty degeneration of heart
- Fatty degeneration of myocardium
- Interstitial myocarditis
- Myocardial degeneration

(*d*) **Myocarditis unspecified (under 45 years)**

- Myocarditis (under 45 years)
- Myopericarditis (under 45 years)

(*e*) **Myocarditis unspecified (45 years and over)**

- Inflammation of myocardium (age 45 and over)
- Myocardial disease
- Myocardial insufficiency
- Myocarditis (age 45 and over)

100. Diseases of coronary arteries and angina pectoris

The approved subtitles and terms are:

(*a*) **Angina pectoris**

- Angina of heart
  - pectoris
- Cardiac angina
- Stenocardia

(*b*) **Diseases of the coronary arteries (not specified as arteriosclerotic)**

- Coronary occlusion
- Disease of coronary artery
- Embolism of coronary artery
- Obstruction of coronary artery of heart
- Rupture of coronary artery of heart
- Thrombosis of coronary artery of heart
- Thrombotic occlusion of coronary artery

(*c*) **Arteriosclerosis of coronary artery**

- Aneurysm of coronary artery
  - heart
- Arteriosclerosis of coronary artery
- Infarction of myocardium

101. Other diseases of the heart

The approved subtitles and terms are:

(*a*) **Functional heart disease**

- Adams-Stokes disease
- Auricular fibrillation
- Brachycardia
- Bradycardia
- Heart-block
- Paroxysmal tachycardia
- Stokes-Adams' disease
- Tachycardia

(b) Rheumatic heart disease (otherwise unspecified)

Rheumatic heart disease (unspecified)

(c) Diseases of heart (specified as arteriosclerotic or as associated with hypertension)

Disease of heart (specified as arteriosclerotic)
Disease of heart (specified as due to hypertension)

(d) Other and unspecified diseases of the heart

102. Aneurysm (except of the heart, aorta, or coronary artery)

The approved terms are:

Aneurysm except of the heart, aorta, or coronary artery (specify site)
Arteriovenous aneurysm

103. Arteriosclerosis (not coronary)

The approved terms are:

Arteriocapillary fibrosis
Arteriofibrosis
Arteriolar sclerosis
Arteriosclerosis
    of brain
Atheroma
Atherosclerosis
Diffuse arteriosclerosis
Endarteritis deformans
General arteriosclerosis

104. Gangrene (not elsewhere provided for)

The approved terms are:

Ainhum
Cancrum oris
Dermatitis gangrenosa
Dry gangrene
Gangrene
Moist gangrene
Noma of mouth
Noma of vulva
Phagedena of penis
    vulva
Raynaud's disease
Senile gangrene
Symmetrical gangrene
Tropical phagedena

105. Other diseases of the arteries

The approved terms are:

Aortitis
Arteritis
    obliterans
Embolism of artery (except coronary and pulmonary)
Endarteritis
    obliterans
Fat embolism
Obliterative arteriolar disease
Obstruction of artery by clot
Thrombosis of artery (except coronary and pulmonary)
    iliac artery

106. Diseases of the veins

The approved subtitles and terms are:

(a) Varix

Aneurysmal varix
Hemorrhoids
Rupture of varicose vein
Varices
Varicocele
Varix (of specified site)

(b) Others under this title

Air embolism
Endophlebitis
Periphlebitis
Phlebitis (unspecified or of specified vein or sinus except puerperal)
Phlebitis migrans
Pylephlebitis
Thrombophlebitis
Thrombosis of vein (except coronary, cerebral, pulmonary or puerperal)

107. Diseases of the lymphatic system (Lymphangitis, etc.)

The approved terms are:

Adenitis (of specified site)
Lymphadenitis (of specified site)
Lymphangitis (of specified site)
Nonfilarial chylocele
    chylous ascites
Obliteration of lymphatic vessel

108. Arterial hypertension

The approved terms are:

Essential hypertension
High blood pressure
Hyperpiesis
Hypertension
Hypertensive vascular disease
Vascular hypertension

109. Other diseases of the circulatory system

The approved terms are:

Epistaxis (unqualified)
Hemorrhage (unqualified)

VIII. DISEASES OF THE RESPIRATORY SYSTEM (110–120)

110. Diseases of nasal fossae and annexa

The approved subtitles and terms are:

(*a*) **Diseases of the nasal fossae**

- Abscess of nasal fossa
- Cerebrospinal rhinorrhea
- Coryza
- Nasopharyngeal abscess
- Ozena
- Rhinitis

(*b*) **Others under this title**

- Abscess of antrum of Highmore
    - ethmoidal sinus
    - frontal sinus
    - maxillary sinus
    - sphenoidal sinus
- Disease of frontal sinus
- Empyema of frontal sinus
- Ethmoidal sinusitis
- Ethmoiditis
- Frontal sinusitis
- Maxillary sinusitis
- Necrosis of antrum
- Sphenoidal sinusitis
- Sphenoiditis
- Suppuration of sinus (specify site)

111. Diseases of the larynx:

The approved terms are:

- Catarrh of larynx
    - throat
- Catarrhal croup
    - laryngitis
- Congestion of glottis
    - larynx
- Epiglottiditis
- Gangrenous laryngitis
- Infective laryngitis
- Inflammation of larynx
- Laryngismus stridulus
- Laryngitis
- Paralysis of glottis
    - larynx
- Phlegmonous laryngitis
- Spasm of glottis
    - larynx
- Spasmodic croup
    - laryngitis
- Stenosis of larynx
- Stridulous croup
    - laryngitis
- Ulcerative larnygitis

112. Bronchitis

The approved subtitles and terms are:

(*a*) **Acute**

- Acute bronchitis
    - pulmonary catarrh
    - purulent bronchitis
- Croupous bronchitis
- Fibrinous bronchitis
- Tracheitis
- Tracheobronchitis

(*b*) **Chronic**

- Bronchial catarrh
- Bronchiectasis
- Chronic bronchitis
    - catarrhal bronchitis
- Dilation of bronchi
- Fetid bronchitis
- Peribronchitis
- Subacute bronchitis
- Ulcerative bronchitis

(*c*) **Unspecified (under 5 years of age)**

(*d*) **Unspecified (5 years of age and over)**

113. Bronchopneumonia (Including Capillary Bronchitis)

The approved terms are:

- Aspiration pneumonia (query for cause)
- Capillary bronchitis
- Bronchopneumonia
- Bronchopulmonitis
- Catarrhal inflammation of lung
- Deglutition pneumonia
- Inhalation pneumonia (query for cause)
- Inspiration pneumonia (query for cause)
- Lobular pneumonia
- Septic bronchopneumonia (query for cause of sepsis)

114. Lobar Pneumonia

The approved terms are:

- Acute hepatization of lung
    - inflammation of lung
    - interstitial pneumonia
    - pleuropneumonia
- Bilateral lobar pneumonia
    - pneumonia
- Consolidation of lung
- Croupous pneumonia
- Double pleuropneumonia
    - pneumonia
- Fibrinous pneumonia
- Hepatization of lung
- Lobar pneumonia (specify infecting organism)
- Pneumococcus pneumonia (specify type)
- Solidification of lung
- Unresolved pneumonia

115. Pneumonia, Unspecified

The approved terms are:

- Pneumonia (query for primary cause)
- Septic pleuropneumonia
- Septic pneumonia
- Suppurative pneumonia

116. Pleurisy

The approved subtitles and terms are:

(*a*) **Empyema**

- Double empyema
- Empyema
- Purulent pleurisy
- Pyothorax
- Seropurulent pleurisy
- Suppurative pleurisy
- Thoracic fistula

(*b*) **Other and unspecified pleurisy**

- Chylous hydrothorax
- Diaphragmatic pleurisy
- Double hydrothorax (query for cause)
  - pleuritis
- Exudative pleurisy
- Fibrinous pleurisy
- Fibrous pleurisy
- Hemopneumothorax
- Hydropneumothorax
- Hydrothorax (query for cause)
- Plastic pleurisy
- Pleurisy with effusion
- Pleuropericarditis
- Pneumothorax
- Pyopneumothorax
- Serofibrinous pleurisy
- Subacute pleurisy

117. Hemorrhagic Infarction, Edema and Chronic Congestion of the Lung [1]

The approved subtitles and terms are:

(*a*) **Hemorrhagic infarction of lung**

- Apoplexy of lung
- Embolism of lung
- Infarction of lung
- Pulmonary embolism
- Pulmonary infarction
  - thrombosis
- Thrombosis of pulmonary artery

(*b*) **Acute edema of lung**

- Edema of lung
- Pulmonary edema

(*c*) **Chronic congestion of lung**

- Chronic pulmonary edema
- Congestion of lung
- Hypostatic congestion
  - pneumonia
- Pulmonary congestion
  - stasis

118. Asthma

The approved terms are:

- Asthma
- Asthmatic bronchitis
- Bronchial asthma
- Catarrhal asthma
- Spasmodic asthma

119. Pulmonary emphysema

The approved terms are:

- Congenital emphysema
- Emphysema of lung
- Hypertrophic emphysema
- Interlobular emphysema
- Pulmonary emphysema
- Senile emphysema
- Vesicular emphysema

120. Other diseases of the respiratory system (tuberculosis excepted)

The approved subtitles and terms are:

(*a*) **Occupational diseases of the respiratory system**

- Asbestosis
- Chronic interstitial pneumonia (specified as occupational)
- Silicosis

(*b*) **Others (including gangrene of the lung)**

- Abscess of lung (specify cause)
  - mediastinum
- Acute mediastinitis
- Chronic interstitial pneumonia (not specified as occupational)
  - mediastinitis
  - pleuropneumonia
- Gangrene of lung
- Hernia of lung
- Pulmonary abscess (specify cause)
- Stenosis of bronchi
  - trachea
- Tracheostenosis
- Ulcer of bronchi
  - trachea

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[1] All terms under this title should be queried for primary cause.

IX. DISEASES OF THE DIGESTIVE SYSTEM (121–134)

121. Diseases of buccal cavity and annexa, and of the pharynx and tonsils (including adenoid vegetations)

The approved subtitles and terms are:

(a) Diseases of the pharynx and tonsils

- Abscess of pharynx
  - tonsil
- Acute pharyngitis (specify organism when known)
  - tonsillitis (specify organism when known)
- Cellulitis of pharynx
- Chronic pharyngitis (specify organism when known)
- Follicular amygdalitis
  - tonsillitis
- Parenchymatous tonsillitis
- Peritonsillar abscess
- Postpharyngeal abscess
- Quinsy
- Retropharyngeal abscess
- Stricture of pharynx (state cause of stricture and manner of death)
- Suppurative tonsillitis
- Tonsillopharyngeal abscess

(b) Others under this title

- Adenoid growth
  - vegetations
    - of nasal fossa
- Adenoids
- Glossitis
- Leukoplakia
- Ludwig's angina
  - disease
- Pyorrhea alveolaris
- Stomatitis
- Ulorrhagia

122. Diseases of the esophagus

The approved terms are:

- Abscess of esophagus
- Obstruction of esophagus
- Stenosis of esophagus
- Stricture of esophagus
- Ulcer of esophagus

123. Ulcer of the stomach or duodenum

The approved subtitles and terms are:

(a) Ulcer of the stomach

- Gastric ulcer
- Gastroduodenal ulcer
- Gastroesophageal ulcer
- Peptic ulcer
- Perforating gastric ulcer
  - ulcer of stomach
- Perforation of stomach (non-traumatic, as from ulcer)
- Round ulcer of stomach
- Ulcer of pylorus
  - stomach
- Ulcus rotundum
  - ventriculi

(b) Ulcer of the duodenum

- Duodenal ulcer
- Perforating ulcer of duodenum
- Ulcer of duodenum

124. Other diseases of the stomach

The approved terms are:

- Abscess of stomach
- Cardiospasm (for children under 1 year of age)
- Gangrene of stomach
- Hematemesis (1 month and over)
- Hemorrhagic gastritis
- Hypertrophic stenosis of pylorus
- Laceration of stomach (not external violence)
- Obstruction of pylorus (6 months and over)
- Phlegmonous gastritis
- Pylorospasm (for children under 1 year of age)
- Rupture of stomach (nontraumatic)
- Stenosis of pylorus of stomach (age 6 months and over)
- Stricture of cardia of stomach (nonmalignant)
  - pylorus (nonmalignant) (6 months and over)
  - stomach (nonmalignant)

125. Diarrhea and enteritis

(a) Under 2 years of age

See subtitle (b) for approved terms

(b) Two years and over

The approved terms are:

- Catarrhal colitis (acute or chronic)
  - diarrhea (acute or chronic)
  - enteritis (acute or chronic)
  - gastroduodenitis (acute or chronic)
  - gastroenteritis (acute or chronic)
  - ileocolitis (acute or chronic)
- Colitis
- Croupous colitis
  - enteritis
- Diarrhea (specify cause)
- Enteritis
- Enterocolitis
- Gastroenteritis
- Gastrointestinal ulceration
- Hemorrhagic colitis
  - enteritis
  - gastroenteritis
- Ileocolitis
- Infantile diarrhea
  - enteritis
- Membranous colitis
  - enteritis
  - enterocolitis
  - ileocolitis
- Mucoenteritis
- Necrotic colitis
- Perforating ulcer of intestine
- Phlegmonous enteritis
- Pseudomembranous enteritis
- Sarcinal infection
- Sigmoiditis
- Ulcer of colon
  - intestine
- Ulceration of colon
  - ileum
  - intestine
- Ulcerative colitis
  - enteritis
  - enterocolitis
  - ileocolitis
  - perforation of intestine

126. Appendicitis

The approved terms are:

Abscess of appendix
  iliac fossa
  vermiform appendix
Appendicitis
Appendicular abscess
Foreign body in appendix
Fulminating appendicitis
Gangrenous appendicitis
Perforative appendicitis
Pericecal abscess
Perityphlitic abscess
Perityphlitis
Postcecal abscess
Recurrent appendicitis
Ruptured appendix
Sloughing appendix
Suppurative appendicitis
Typhlitis
Typhlodicliditis

127. Hernia, intestinal obstruction

The approved subtitles and terms are:

(*a*) **Hernia**

Gangrenous hernia (with site specified)
Herniotomy
Incarcerated hernia (with site specified)
Strangulated hernia (with site specified)

(*b*) **Intestinal obstruction**

Coprolith
Fecal impaction
Ileus
Impaction of feces
Intestinal obstruction (site and cause to be specified)
Intussusception
Strangulation of bowel
Telescoped bowel
Twist of bowel
Volvulus

128. Other diseases of the intestines

The approved terms are:

Abscess of Meckel's diverticulum
Diverticulitis
Diverticulosis
Enteric paralysis
Gangrene of the rectum
Ischiorectal abscess
Paralysis of colon
  intestine
Perforation of bowel
  intestine
Periproctitis
Perirectal abscess
  cellulitis
Procidentia recti
Rupture of duodenum
  rectum
Stricture of anus
  rectum

129. Cirrhosis of the liver

The approved subtitles and terms are:

(*a*) **Specified as alcoholic**

Alcoholic cirrhosis
  of liver
Alcoholic hepatitis
Alcoholic liver
Laennec's cirrhosis

(*b*) **Not specified as alcoholic**

Atrophic cirrhosis of liver
Biliary cirrhosis
Chronic hypertrophic hepatitis
Cirrhosis of liver
Congenital cirrhosis (age 3 months and over)
  of liver (age 3 months and over)
  hepatic cirrhosis (age 3 months and over)
Fatty degeneration of liver
  liver
Hepatic cirrhosis
Hypertrophic cirrhosis
  of liver
Portal cirrhosis
Toxic cirrhosis

130. Other diseases of the liver (including acute yellow atrophy of liver)

The approved subtitles and terms are:

(*a*) **Acute yellow atrophy of liver**

Acute atrophy of liver
  parenchymatous hepatitis
  yellow atrophy of liver
Icterus gravis
Malignant hepatitis (age 3 months and over)
  icterus (age 3 months and over)
  jaundice (age 3 months and over)
Pernicious icterus
Subacute yellow atrophy of liver

(*b*) **Others under this title**

Abscess of liver
Diffuse suppurative hepatitis
Hematogenous icterus (age 3 months and over)
  jaundice (age 3 months and over)
Hemolytic icterus
Perihepatitis

131. Biliary calculus

The approved terms are:

Biliary calculus
  colic
  lithiasis
Cholelithiasis
Colic from gallstones
Common duct stone
Impacted gallstones

132. Other diseases of the gall bladder and biliary passages

The approved terms are:

- Abscess of gall bladder
- Acute catarrhal jaundice (age 3 months and over)
- Angiocholecystitis
- Angiocholitis
- Biliary fistula
- Catarrh of bile duct
- Catarrhal cholangitis
  - icterus (age 3 months and over)
  - jaundice (age 3 months and over)
- Cholangitis
- Cholecystitis
- Choledochitis
- Chronic catarrhal jaundice
- Empyema of gall bladder
- Gangrene of gall bladder
  - gall duct
- Infectious cholecystitis
- Necrosis of gall bladder
- Perforation of bile duct
  - gall bladder
  - gall duct
- Rupture of bile duct
  - gall bladder
  - gall duct
- Stenosis of bile duct
  - gall duct
- Stricture of common duct
  - gall bladder
  - gall duct
- Suppuration of gall bladder
- Suppurative cholangitis
  - cholecystitis
  - choledochitis

133. Diseases of the pancreas

The approved terms are:

- Abscess of pancreas
- Acute gangrenous pancreatitis
  - hemorrhagic pancreatitis
  - pancreatitis
  - suppurative pancreatitis
- Calculus of pancreatic duct
- Chronic interstitial pancreatitis
  - suppurative pancreatitis
- Cyst of pancreas (due to obstruction)
- Necrosis of pancreas (due to infection)
- Pancreatic fat necrosis

134. Peritonitis (cause not specified)

The approved terms are:

- Acute fibrinopurulent peritonitis
  - fibrinous peritonitis
  - general peritonitis
  - hemorrhagic peritonitis
- Acute serofibrinous peritonitis
  - suppurative peritonitis
- General purulent peritonitis
- Subdiaphragmatic abscess
- Subphrenic abscess

X. NONVENEREAL DISEASES OF THE GENITO-URINARY SYSTEM AND ANNEXA (135–144)

135. Acute, subacute, and chronic glomerulonephritis (including nephritis unspecified under 10 years)

The approved subtitles and terms are:

(*a*) **Acute and subacute glomerulonephritis**

- Acute albuminous nephritis
  - Bright's disease
  - diffuse nephritis
  - exudative nephritis
  - glomerulonephritis
- Acute hemorrhagic nephritis
  - nephritis
  - parenchymatous nephritis
  - tubular nephritis (not due to specified poison)
- Subacute nephritis
  - glomerulonephritis

(*b*) **Chronic glomerulonephritis**

- Chronic Bright's disease
  - diffuse nephritis
  - exudative nephritis
- Chronic glomerulonephritis
  - parenchymatous nephritis
  - tubular nephritis
- Secondary contracted kidney

(*c*) **Nephritis (unqualified; under 10 years of age)**

- Nephritis (under 10 years)

136. Primary hypertensive nephritis (primary vascular renal disease)

The approved subtitles and terms are:

(*a*) **Cardiorenal sclerosis**

- Arteriolar nephrosclerosis
- Cardiorenal sclerosis
- Primary contracted kidney

(*b*) **Others under this title**

- Chronic interstitial nephritis
- Chronic nephritis

137. Nephritis, not specified (10 years and over)

The approved terms are:

- Bright's disease (10 years and over)
- Diffuse interstitial nephritis
- Granular kidney
- Hypertropic interstitial nephritis
- Nephritis (10 years and over)

138. Other diseases of the kidneys and annexa

The approved subtitles and terms are:

(*a*) **Pyelitis (not associated with pregnancy or the puerperium)**

- Pyelitis
- Pyelonephritis
- Pyonephrosis
- Suppurative pyelitis

(*b*) **Others under this title**

- Abscess of kidney
- Floating kidney
- Hydronephrosis
- Infarct of kidney
- Nephritic abscess
- Nephrosis (not a complication of nephritis)
- Perinephric abscess
- Perinephritic abscess
- Perirenal abscess
- Purulent nephritis
- Pyonephritis
- Renal abscess
- Septic nephritis
- Suppurative nephritis

139. Calculus of the urinary passages

The approved terms are:

- Calculus pyelitis
  - pyelonephritis
  - pyonephrosis
- Calculus of bladder
  - kidney
  - pelvis of kidney
  - ureter
  - urethra
- Impacted calculus of kidney
  - ureter
  - urethra
- Lithotrity
- Nephrolithiasis
- Pyonephrosis from calculus
- Renal calculus
  - colic
- Stone in bladder
  - kidney
- Ureterolithotomy
- Urinary calculus
  - lithiasis
- Vesical calculus

140. Diseases of the urinary bladder

The approved subtitles and terms are:

(*a*) **Cystitis**

- Abscess of bladder
- Gangrene of bladder
- Gangrenous cystitis
- Purulent cystitis
- Pyocystitis
- Suppurative cystitis
- Vesical abscess

(*b*) **Others under this title**

- Fistula of bladder (nontraumatic; specify abnormal opening)
- Rupture of bladder (not external violence)

141. Diseases of the urethra, urinary abscess, etc. (tumors and calculus excepted)

The approved subtitles and terms are:

(*a*) **Stricture of the urethra**

- Stricture of the urethra

(*b*) **Others under this title**

- Laceration of urethra (not external violence)
- Rupture of urethra (not external violence)

142. Diseases of the prostate

The approved terms are:

- Abscess of prostate
- Calculus of prostate
- Enlargement of prostate
- Hypertrophy of prostate
- Inflammation of prostate
- Prostatitis
- Prostatocystitis

143. Diseases of the male genital organs, not specified as venereal

The approved terms are:

- Circumcision (for disease)
- Epididymitis
- Hydrocele of spermatic cord
  - tunica vaginalis
- Orchitis
- Phimosis (not congenital)
- Spermatocele

144. Diseases of the female genital organs not specified as venereal or puerperal

The approved subtitles and terms are:

(*a*) **Cyst of the ovary**

- Cyst of ovary
- Cystic oophoritis
  - ovaritis
  - ovary
- Ovarian cyst
- Parovarian cyst

(b) Other diseases of the ovary and diseases of the Fallopian tube and parametrium

Abscess of broad ligament
    Fallopian tube
    ovary
Diffuse pelvic cellulitis (female)
Hematosalpinx
Oophoritis
Ovaritis
Pelvic abscess (female)
    cellulitis (female)
Periuterine abscess

Phlegmon of broad ligament (nonpuerperal or unqualified)
Pyo-oophoritis
Pyosalpinx
Retrouterine abscess
Rupture of Fallopian tube
Salpingitis, acute (specify organism when known)
    chronic (specify organism when known)
Suprapelvic abscess

(c) Diseases of the uterus

Endometritis
Hemorrhage of uterus
Hemorrhagic metritis
Inflammation of uterus
Intrauterine hemorrhage
Procidentia of uterus
Prolapse of uterus
Purulent endometritis

Pyometra
Retroversion of uterus
Septic endometritis
    metritis
    phlebitis
Suppurative metritis
Uterine hemorrhage

(d) Nonpuerperal diseases of the breast (cancer excepted)

Mastitis

Suppuration of breast
    mammary gland

(e) Other diseases of the female genital organs

Abscess of Bartholin's gland
Abscess of labium majus

Cellulitis of vulva
Ulceration of labium majus

XI. DISEASES OF PREGNANCY, CHILDBIRTH, AND THE PUERPERAL STATE (145–151)

145. Abortion and premature delivery with septic condition specified

The approved subtitles and terms are:

(a) Abortion (with septic condition specified) under 28 weeks gestation, or unspecified

Peritonitis following abortion
Postabortive sepsis

Pyemia following abortion
Septicemia following abortion

(b) Abortion (with septic condition specified) with pyelitis, under 28 weeks gestation, or unspecified

Pyelitis following abortion

Pyelonephritis following abortion

(c) Premature delivery (with septic condition, specified) 28 weeks gestation and over, or unspecified

Peritonitis following premature delivery
Sepsis following premature delivery

Pyemia following premature delivery
Septicemia following premature delivery

(d) Premature delivery (with septic condition specified) with pyelitis, 28 weeks gestation and over, or unspecified

Pyelitis following abortion

Pyelonephritis following abortion

146. Abortion and premature delivery, without mention of septic condition (to include hemorrhage, trauma and shock)

The approved subtitles and terms are:

(a) Abortion without mention of septic condition under 28 weeks gestation, or unspecified

Abortion (under 28 weeks gestation)
Accidental abortion
Induced abortion

Miscarriage
Therapeutic abortion

(b) Abortion without mention of septic condition (hemorrhage, trauma or shock specified) under 28 weeks gestation, or unspecified

Accidental hemorrhage

Hemorrhage of pregnancy

(c) Premature delivery without mention of septic condition, 28 weeks gestation and over, or unspecified

Induced premature delivery
Premature delivery

Premature labor
    birth

(d) Premature delivery without mention of septic condition, (hemorrhage, trauma or shock specified) 28 weeks gestation and over, or unspecified

Accidental hemorrhage of pregnancy
Antepartum hemorrhage

Hemorrhage of pregnancy

147. Ectopic gestation

The approved subtitles and terms are:

(a) Ectopic gestation with septic condition

Abdominal pregnancy, septic
Ectopic gestation, septic
Extrauterine pregnancy, septic

Infected tubal pregnancy
Tubal pregnancy, septic

(b) Ectopic gestation with mention of hemorrhage, but without mention of septic condition

Abdominal pregnancy, with hemorrhage
Ectopic gestation, with hemorrhage

Extrauterine pregnancy, with hemorrhage
Tubal pregnancy, with hemorrhage

(c) Ectopic gestation without mention of septic condition or hemorrhage

Abdominal pregnancy
Ectopic gestation
        pregnancy

Extrauterine gestation
        pregnancy
Tubal abortion
        gestation
        pregnancy

148. Antepartum, intrapartum, and postpartum hemorrhage, trauma and shock

The approved subtitles and terms are:

(a) Antepartum and intrapartum hemorrhage

Accidental hemorrhage of parturition
Hemorrhage during parturition
        from uterus during parturition

Malposition of placenta
Placenta praevia
Premature separation of placenta

(b) Postpartum hemorrhage (including third state of labor)

Accidental hemorrhage of the puerperium
Adherent placenta
Hemorrhage after labor
        detachment of placenta
        from uterus after parturition

Retained membranes
        placenta
        secundines

(c) Hemorrhage of pregnancy not specified as antepartum, intrapartum or postpartum

Puerperal hemorrhage

(d) Trauma and shock without mention of hemorrhage (antepartum, intrapartum or postpartum)

Inversion of uterus
Laceration of cervix
        pelvic floor
        perineum
        peritoneum
        urinary bladder
        uterus
        vagina
        vulva

Obstetric shock
Perforation of part specified
Rupture of bladder (parturition)
        uterus
        tissue or part specified (parturition)

149. Puerperal infection (not specified as due to abortion or premature delivery)

The approved subtitles and terms are:

(a) General and local puerperal infection

Postpartum pyemia
        sepsis
        septicemia
Puerperal erysipelas
        fever
        inflammation of uterus
        lymphangitis
        metritis
        metroperitonitis
        metrosalpingitis
        pelvic cellulitis
                peritonitis
        peritoneal infection
        peritonitis

Puerperal periuterine cellulitis
        purulent endometritis
        pyelitis
        pyelonephritis
        pyemia
        salpingitis
        sapremia
        sepsis
        septic endometritis
                fever
                infection
                metritis
                peritonitis
        septicemia
        suppurative metritis

(b) Puerperal thrombophlebitis

Milk leg
Puerperal embolism of lung
        embolus
        thrombophlebitis
Phlegmasia alba dolens

Pulmonary embolism (during puerperium)
Sudden death during puerperium (cause unknown)
        from embolus (during puerperium)
Venous thrombosis (consequent on parturition)

(c) Puerperal tetanus

Puerperal tetanus

150. Toxemias of pregnancy

The approved subtitles and terms are:

(a) Eclampsia

Eclampsia gravidarum
        of labor
        pregnancy

Postpartum eclampsia
Puerperal convulsions
        eclampsia

(*b*) **Vascular-renal toxemia**

Acute nephritis (pregnancy)
Nephritic toxemia
Pre-eclamptic toxemia
Postpuerperal nephritis

Puerperal albuminuria
  nephritis
  uremia
Toxemia of pregnancy
Uremia of pregnancy

(*c*) **Others**

Emesis gravidarum
Hyperemesis gravidarum
  of pregnancy
Persistent vomiting (pregnancy)

Puerperal vomiting
Uncontrollable vomiting of pregnancy
Vomiting of pregnancy

151. Other and unspecified conditions of the puerperal state

The approved subtitles and terms are:

(*a*) **Infection of breast**

Abscess of breast following parturition
Mastitis

Puerperal abscess of breast
  mammary abscess

(*b*) **Psychoses of puerperium**

Puerperal insanity

Puerperal melancholia

(*c*) **Other and unspecified conditions of the puerperal state (all to be queried for disease or condition causing death)**

Atony of uterus during parturition
Breech presentation
Caesarian operation
Delayed delivery
Difficult labor
Dystocia
Faulty presentation (mother)
Foot presentation

Inertia of uterus
Instrumental delivery
Multiple birth
Prolonged labor
Protracted labor
Subinvolution of uterus
Transverse presentation
Version

XII. DISEASES OF THE SKIN AND CELLULAR TISSUES (152–154)

152. Carbuncle, furuncle

The approved terms are:

Carbuncle
Furuncle

Furunculosis
Multiple carbuncle

153. Cellulitis, acute abscess

The approved terms are:

Abscess (unqualified)

Cellulitis (see Abscess)

Inasmuch as an abscess at any specified location may be insufficient to cause death by itself, supplementary data as to the site and nature of the original infection should be supplied. Hence, a list of approved terms to be included under this title is omitted, as there is no limit to the number of places in which abscesses may occur. Abscess of site specified is usually classified under the particular organ or anatomical region involved.

154. Other diseases of the skin and annexa, and of the cellular tissue

The approved terms are:

Bed-sore
Decubitis
Dermatitis venenata

Elephantiasis (nonfilarial)
Malignant pemphigus
Scleroderma

Inasmuch as any one of the great number of skin diseases may lead to death through the development of secondary sepsis, it has seemed inadvisable to extend further the list of inclusions under this title, since it would be necessary to include a very large number of dermatological terms to make the list complete.

XIII. DISEASES OF THE BONES AND ORGANS OF LOCOMOTION (155–157)

155. Osteomyelitis and periostitis

The approved subtitles and terms are:

(*a*) **Acute osteomyelitis and periostitis**

Acute infective osteomyelitis
  osteoperiostitis
  periostitis

Acute osteomyelitis
  suppurative osteomyelitis

(*b*) **Chronic osteomyelitis and periostitis**

Caries of bone
Circumscribed periostitis
Chronic osteomyelitis
  periostitis
Diffuse periostitis
Gangrene of bone

Necrosis of bone
Osteoperiostitis
Periosteal abscess
Periostitis
Suppurative periostitis

156. Other diseases of the bones (tuberculosis excepted)

The approved terms are:

- Fragilitas ossium
- Osteitis deformans
- Pulmonary osteoarthropathy
- Spontaneous fracture of bone

A footnote should follow this title explaining that it does not include rheumatism and tuberculosis; also that where diseases of the bone affect structures connected with the special senses—nasal fossae, ear, orbit—they are to be referred to the appropriate title headings covering diseases of these organs of special sense.

157. Diseases of the joints and other organs of locomotion

The approved subtitles and terms are:

(*a*) **Diseases of the joints (tuberculosis and rheumatism excepted)**

- Abscess of joint (specify joint)
- Arthropathy
- Infective synovitis
- Inflammation of joint (specify joint)
- Purulent arthritis
  - synovitis
- Septic arthritis
- Suppurative synovitis

(*b*) **Diseases of other organs of locomotion**

- Abscess of bursa
  - muscle
  - tendon
- Amyotonia
- Bursitis (specify site)
- Infective myositis (specify site)
- Inflammation of bursa (specify site)
  - fascia (specify site)
  - muscle (specify site)
  - sheath of tendon (specify site)
- Myasthenia gravis
- Myositis
  - fibrosa
  - ossificans
- Polymyositis
- Progressive muscular dystrophy
  - ossifying myositis
- Spasmodic torticollis
- Tenontosynovitis
- Tenosynovitis
- Thecal abscess
- Torticollis

XIV. CONGENITAL MALFORMATIONS (158)

158. Congenital malformations

The approved subtitles and terms are:

(*a*) **Congenital hydrocephalus**

- Chronic hydrocephalus
- Congenital cerebral tumor
  - hydrocephalus
- Congenital tumor of brain
- Hydrocephalus of brain
- Megalocephaly

(*b*) **Spina bifida and meningocele**

- Congenital spina bifida
- Meningocele
- Meningomyelocele
- Spina bifida
- Spinal hernia
  - meningocele
- Syringomyelocele

(*c*) **Congenital malformations of the heart**

- Atelocardia
- Congenital disease of heart
  - malformation of heart
  - valvular heart disease
- Cyanosis (due to malformation of heart)
  - (persistence of foramen ovale)
- Cyanosis from nonclosure of foramen of Botallo
- Imperfect closure of foramen ovale
- Morbus caeruleus
- Nonclosure of foramen of Botallo
- Patent ductus arteriosus
  - foramen of Botallo

(*d*) **Congenital pyloric stenosis**

- Congenital pyloric stenosis
- Stenosis of pylorus (under 6 months)

(*e*) **Cystic disease of the kidney**

- Congenital cystic disease of the kidney
- Polycystic kidney (congenital)

(*f*) **Imperforate anus**

- Imperforate anus
- Imperforate rectum

(*g*) **Cleft palate—Harelip**

- Cleft palate
- Fissure of lip (harelip)
- Harelip

(*h*) **Other specified congenital malformations**

- Branchial cyst
- Cerebral meningocele
- Congenital amputation
  - atresia (of any part of body)
  - cerebral hernia
  - fracture
  - hernia (specify site)
  - imperforate urethra
  - intestinal obstruction
  - laryngeal obstruction
  - stenosis of intestine
    - larynx
  - tumor (specify site)
- Extrophy of bladder
- Extroversion of bladder
- Hemicephalus
- Hirschsprung's disease
- Hydrencephalocele
- Hydromyelia
- Hydrorrachia
- Imperforate pharynx
- Malformation (specify part of body)
- Megacolon
- Meningoencephalocele
- Microcephaly
- Monster
- Omphalocele
- Podencephalus

(*i*) **Congenital malformation, unspecified (should be queried)**

XV. DISEASES OF EARLY INFANCY (159–162)

159. Congenital Debility

The approved terms are:

- Artificial feeding (under 1 year)
- Hydramnios (death of child)
- Malassimilation (under 1 year)
- Marasmus (under 1 year)
- Puerperal eclampsia (death of child)
  - toxemia (death of child)

160. Premature birth

The approved terms are:

- Immaturity
- Incomplete gestation
- Miscarriage
- Multiple birth
- Premature birth
- Prematurity

161. Injury at birth

The approved subtitles and terms are:

(*a*) **With mention of Caesarian operation**

- Caesarian operation

(*b*) **Without mention of Caesarian operation**

- Breech presentation
- Cephalic hemorrhage (at birth)
- Cerebral compression (injury at birth)
  - pressure (injury at birth)
- Compression during birth (injury at birth)
  - of brain (injury at birth)
  - umbilical cord
- Delayed confinement
  - delivery
- Difficult labor
- Dystocia
- Foot presentation
- Forced delivery
- Forceps operation
- Injury at birth
  - delivery
- Instrumental delivery
- Intracranial trauma
- Malpresentation
- Placenta praevia
- Prolapse of funis
  - umbilical cord
- Prolonged labor
- Protracted dry labor
  - labor
- Rupture of brain (incident to birth)
- Ruptured viscus
- Strangulation of umbilical cord
- Transverse presentation
- Vectis (use of)
- Version

(*c*) **Cerebral hemorrhage (age under 1 month)**

- Cephalhematoma
- Cerebral hemorrhage
- Hematoma
- Intracranial hemorrhage

162. Other specified and unspecified diseases peculiar to early infancy

The approved subtitles and terms are:

(*a*) **Asphyxia**

- Antenatal asphyxia
- Asphyxia neonatal
- Atelectasis
- Inspiration of vaginal mucus
- Natal asphyxia
- Post-natal asphyxia
- Strangulation by mucus

(*b*) **Maternal toxemia**

- Maternal diabetes
  - hyperinsulinemia
- Maternal nephritis
  - toxemia

(*c*) **Infections**

- Cellulitis of umbilicus
- Infected navel
  - umbilicus
- Infectious omphalitis
- Omphalitis
- Pemphigus
  - of infant
  - neonatorum
- Phlebitis of umbilicus
- Septic infection of umbilicus
- Septicemia of umbilicus
  - from navel
- Sepsis neonatorum

(*d*) **Other specified diseases peculiar to early infancy**

- Gangrene of umbilical cord
- Hemorrhage of funis
  - navel
  - newborn
  - umbilical cord
  - umbilicus
- Icterus of the newborn
- Acute catarrhal hepatitis
  - jaundice
- Congenital cirrhosis of liver
  - icterus
- Hematogenous icterus
  - jaundice
- Congenital sclerema
- Melena neonatorum
- Pulmonary hemorrhage
- Hemorrhagic icterus
  - jaundice
- Hepatitis of newborn
- Icterus neonatorum
- Jaundice of newborn
- Sclerema
  - neonatorum

(*e*) **Unspecified diseases peculiar to early infancy**

XVI. OLD AGE (163)

163. Senility

The approved subtitles and terms are:

(*a*) **Senility accompanied by dementia or other forms of mental alienation** (70 years and over)

Dementia of old age
Senile dementia
insanity
Senile paresis
psychosis
melancholia

(*b*) **Senility, other of this class**

Morbus senilis
Old age
Senility

The Committee recommends that all reports of deaths under 70 years of age which would be classified under this title heading be queried for the disease causing death. These reports are too often used on death certificates of elderly persons, whose deaths should have been reported as due to diseases of various organs.

Deaths from senility accompanied by dementia, in persons under 70 years of age, should be classified under title No. 200c.

The Committee declares its reason for recommending that these subtitles be established to be as follows: It believes that many of the deaths reported from hospitals for the insane as due to senile dementia, senile insanity, etc., are more properly chargeable to title 91 (dementia praecox and other psychoses) than they are to senility. These, however, are so numerous that the transfer of all such cases to title 91 would make a very great difference in the number of deaths classified under both titles 91 and 163, and a corresponding difference in the published death rates. The subdivisions, as now recommended, will enable anyone who so desires to ascertain the number of deaths reported from senility accompanied by mental alienation.

XVII. DEATHS FROM VIOLENCE (164–199)

164. Suicide by solid or liquid poisons or by absorption of corrosive substances

The approved terms are:

Poisoning (suicidal)
Suicide by poison (any solid or liquid)

165. Suicide by poisonous gas

The approved terms are:

Suicide by asphyxia (any gas or vapor)
carbon monoxide
chloroform (vapor)
gas (any gas)
Suicide by illuminating gas
inhalation of gas (any gas or vapor)
suffocation (any gas or vapor)
vapor (any vapor)

166. Suicide by hanging or strangulation

The approved terms are:

Suicide by hanging
Suicide by strangulation

167. Suicide by drowning

The approved terms are:

Suicide by drowning
Suicide by submersion

168. Suicide by firearms

The approved terms are:

Suicide by firearms
Suicide by shooting

169. Suicide by cutting or piercing instruments

The approved terms are:

Suicide by cutting artery
blood vessel
instrument
Suicide by cutting throat
piercing instrument

170. Suicide by jumping from high places

The approved term is:

Suicide by jumping from high place

171. Suicide by crushing

The approved terms are:

Suicide by crushing
jumping before train
Suicide by jumping before other vehicles

172. Suicide by other means

The approved terms are:

Suicide (unqualified)
by burns
dynamite
Suicide by fire
scalds

173. Homicide by firearms

The approved terms are:

Assassination by firearms
Gunshot (homicidal)
Homicide by firearms
gunshot
Shooting (homicidal)
Shot (homicidal)
by burglar
in duel
Wound by firearms (homicidal)

174. Homicide by cutting or piercing instruments

The approved terms are:

- Assassination by cutting or piercing instrument
- Cut (homicidal)
- Homicide by cutting instrument
  - piercing instrument
- Knife cut (homicidal)
  - stab
- Wound by cutting instrument (homicidal)

175. Homicide by other means

The approved terms are:

- Assassination (without further explanation)
- Assault by maniac
- Bite of human being
- Drowning (homicidal)
- Duel
- Homicidal poisoning
  - strangulation
  - wound
- Homicide (unqualified)
- Incendiarism
- Lynching
- Manslaughter
- Murder (unqualified)
- Throwing of sulphuric acid
  - vitriol
- Traumatism (homicidal)
- Wound (homicidal)

176. Criminal abortion

The approved term is:

Criminal abortion (mother)

177. Attack by venomous animals

The approved terms are:

- Bite of insect
  - serpent
  - venomous serpent
  - viper
- Snake-bite
- Sting of insect
- Venom of animal
  - centipede
  - scorpion
- Venomous bite
  - sting

178. Poisoning by food

The approved terms are:

- Botulism
- Cheese poisoning
- Egg albumen poisoning
- Fish poisoning
- Food poisoning (food to be specified)
- Meat poisoning
- Milk poisoning
- Potato poisoning
- Sausage poisoning
- Shellfish poisoning

179. Accidental absorption of poisonous gas

The approved subtitles and terms are:

(*a*) **Poisoning by carbon monoxide**

- Automobile exhaust gas poisoning
- Carbon monoxide poisoning
- Poisoning by fuel and other gases containing carbon monoxide
- Illuminating gas poisoning

(*b*) **Poisoning by other gases**

- Acetylene poisoning
- Acute etherism
- Ammonia poisoning
- Amyl nitrite poisoning
- Asphyxia by fumes
  - gas (accidental; specify gas)
- Asphyxia by smoke (conflagration excepted)
  - vapor
- Bisulphide of carbon poisoning
- Chloroform poisoning (vapor)
- Poisoning by anesthetic
  - operation

A footnote should follow this title stating that it does not include deaths in burning buildings.

The Committee also recommends that all reports that do not specify that the poisoning was accidental be queried by registration and compiling offices to determine whether such cases are not properly chargeable to suicide or homicide.

The Committee recommends that a separate tabulation be made of all cases in which death was dependent upon the occupation of the decedent.

180. Other acute accidental poisonings (gas excepted)

The approved terms are:

- Accidental poisoning (specify nature)
- Acute poisoning (specify nature)
- Anaphylaxis
- Serum intoxication
  - poisoning
- Wood alcohol poisoning

All returns which do not specify that the poisoning was accidental should be queried by registration and compiling offices. When this is done many reports will be found to represent cases that are properly chargeable to suicide or homicide.

A footnote should be added to the effect that this title does not include septic poisoning.

181. Conflagration

The approved terms are:

- Conflagration (to include all injuries of whatever nature resulting therefrom)
- Crushed at fire (conflagration)
- Forest fire
- Inhalation of smoke (burning building)
- Jumped from burning building
- Prairie fire
- Suffocation (burning building)

The Committee recommends that a separate tabulation be made of all cases in which death was dependent upon the occupation of the decedent.

182. Accidental burns (conflagration excepted)

The approved terms are:

- Burn (conflagration excepted, of any organ or part)
  - by boiling liquid
    - water
    - coal oil
    - corrosive substance
    - fall with lighted lamp
    - fire
    - gasoline
    - kerosene
    - molten metal
    - petroleum
    - steam
    - sulphuric acid
    - vitriol
- Dermatitis actinica
  - ambustionis
- Effects of corrosives
  - radium
  - X-ray
- Explosion of gasoline
  - kerosene
  - lamp
- Lamp accident
- Scald (of any part of body)
  - by steam
- Sunburn

183. Accidental mechanical suffocation

The approved terms are:

- Asphyxiation by falling earth
- Cave in (unqualified)
- Overlaid
- Suffocation (unqualified)
  - by abnormal atmospheric pressure
  - bed clothes

The Committee recommends that a separate tabulation be made of all cases in which death was dependent upon the occupation of the decedent.

184. Accidental drowning

The approved terms are:

- Accidental drowning
  - submersion
- Asphyxia by drowning
- Drowning (unqualified)
- Found drowned (open verdict)
- Lost at sea
- Suffocation by drowning
  - submersion

The Committee recommends that a separate tabulation be made of all cases in which death was dependent upon the occupation of the decedent.

185. Accidental traumatism by firearms (wounds of war excepted)

The approved terms are:

- Accidental wound by firearms (of any part of body)
- Firearms
- Gunshot
- Pistol wound
- Shooting
- Shot
- Traumatism by firearms
- Wound by firearms

The Committee recommends that all reports which do not specify that the traumatism was accidental be queried by registration and compiling offices to determine whether death was accidental, suicidal or homicidal.

186. Accidental traumatism by cutting or piercing instruments (wounds of war excepted)

The approved terms are:

- Circumcision
- Cut (of any part of body)
  - by glass
- Incised wound (of any part of body)
- Knife cut
  - stab (accident)
- Punctured wound (of any part of body)
- Stab wound (of any part of body, accidental)
- Sterilization
- Traumatism by cutting instrument
  - piercing instrument
- Wound by cutting instrument (of any part of body)
- Wound by piercing instrument (of any part of body)

The Committee recommends that registration and compiling offices query all reports which do not specify definitely that a traumatism was accidental, to determine whether death was actually due to an accident, suicide or homicide.

The Committee recommends that a separate tabulation be made of all cases in which death was dependent upon the occupation of the decedent.

187. Accidental traumatism by fall, crushing, landslide

The approved terms and subtitles are:

(a) Accidental traumatism by fall

- Fall (accidental or unqualified)
  - downstairs
- Injury by diving
  - from fall

(b) Accidental traumatism by crushing, landslide

- Crushed by falling earth
- Crushing
- Landslide
- Traumatism by crushing
  - landslide

The Committee recommends that a footnote be added stating that this title does not include accidents connected with traffic, in burning building, or in mines or quarries, and that a separate tabulation be made of all cases in which death was dependent upon the occupation of decedent.

The Committee recommends that the title *Cataclysm* be abolished and that the terms be transferred to title 194, and others.

188. Injuries by animals (except poisonous animals)

The approved terms are:

Bite of (any animal)
        dog
Injury by any animal
Kick (by horse or other animal)
Traumatism by horse

The Committee recommends that a separate tabulation be made of all cases in which death was dependent upon the occupation of decedent.

189. Hunger and thirst

The approved terms are:

Deprivation of water
Hunger
Inanition (starvation)
Insufficient nourishment
Lack of food
Starvation
Thirst

The words "starvation" and "inanition" are sometimes used in the United States and Canada to denote exhaustion from defective nourishment due to disease or to senile or congenital debility. Only where death was caused by actual privation should assignment be made to this title.

190. Excessive cold

The approved terms are:

Effects of cold (temperature)
Exposure to cold
Freezing
Frostbite
Frozen

The Committee recommends that a separate tabulation be made of all cases in which death was dependent upon the occupation of decedent.

191. Excessive heat

The approved terms are:

Effects of heat
Excessive heat
Heat apoplexy
        cramps
        exhaustion
        prostration
        stroke
Insolation
Overheated
Sun stroke
Thermic fever

The Committee recommends that a separate tabulation be made of all cases in which death was dependent upon the occupation of decedent.

192. Lightning

The approved terms are:

Lightning
Thunderbolt

193. Accidents due to electric currents

The approved terms are:

Accidental electric shock
        electrocution
Burn by electricity
Electric concussion
Electric shock
Electricity (lightning excepted)
Injury by electric shock

194. Other and unstated forms of accidental violence

The approved subtitles and terms are:

(*a*) By foreign bodies (site, organ, or orifice to be specified)

(*b*) Cataclysm

Earthquake
Cyclone
Tornado
Hurricane

(*c*) Others under this title

Desertion (newborn)
Explosion
Football accident
Lack of care
Rupture of uterus (nonpuerperal or unspecified)

Note.—This is the residual title for external causes. Many indefinite returns found here could be assigned elsewhere if the means of death and the character of violence (accidental, suicidal or homicidal) were stated.

195. Violent deaths of which nature (accident, suicide, homicide) is unknown

Note.—Include under this title only deaths from "other external violence" when doubt is expressed as to whether accidental, suicidal, homicidal or wounds of war.

196. Wounds of war

NOTE.—Include under this title all deaths of combatants due to violence even if accidental.

197. Execution of civilians by belligerent armies

198. Legal executions

The approved terms are:

Capital punishment
Electrocution (legal execution)
Execution
Gas asphyxia (execution)
Hanging (legal execution)

XVIII. ILL-DEFINED DISEASES (199–200)

199. Sudden death

Under this title are listed a number of terms all of which are indefinite and unsatisfactory as statements of the primary cause of death.

The Committee is advised that the Bureau of the Census and many State and municipal registration offices are making determined efforts to secure more definite data when such returns are received, and desires to express its approval of this practice. It realizes that until all such reports are eliminated they must be classified somewhere. This, in the opinion of the Committee, is the sole reason for giving this title a place in the International List.

200. Cause of death not specified or ill-defined

(*a*) **Convulsions**
(*b*) **Not specified or unknown**
(*c*) **Ill-defined**
(*d*) **Found dead**

The Committee approves the subdivision of this title as in the Census Manual into (a) Ill-defined and (b) Not specified or unknown.

The inclusions constitute a mass of ill-defined and unsatisfactory terms. None of these could receive the approval of the Committee as terms recommended for use in the United States or Canada. All of them, however, in view of their very indefiniteness, the Committee realizes must be included under this heading when they are encountered and when no more definite information can be secured on inquiry.

The Committee is advised that the Bureau of the Census and many State and municipal registration offices are making determined efforts to secure more definite data when such returns are received, and desires to express its approval of this practice. It realizes that until all such reports are eliminated they must be classified somewhere, and that, therefore under present conditions, this title must remain in the list.

DEATHS DURING WEEK ENDED JAN. 15, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Jan. 15, 1938	Corresponding week, 1937
Data from 86 large cities in the United States:		
Total deaths	9,015	11,152
Average for 3 prior years	10,549	
Total deaths, first 2 weeks of year	18,530	22,547
Deaths under 1 year of age	553	642
Average for 3 prior years	662	
Deaths under 1 year of age, first 2 weeks of year	1,104	1,360
Data from industrial insurance companies:		
Policies in force	69,954,525	69,211,701
Number of death claims	13,846	15,652
Death claims per 1,000 policies in force, annual rate	10.3	11.8
Death claims per 1,000 policies, first 2 weeks of year, annual rate	9.4	11.3

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (------) indicate that cases or deaths may have occurred although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 22, 1938, and Jan. 23, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Jan 22, 1938	Week ended Jan. 23, 1937	Week ended Jan. 22, 1938	Week ended Jan. 23, 1937	Week ended Jan. 22, 1938	Week ended Jan 23, 1937	Week ended Jan 22, 1938	Week ended Jan. 23, 1937
New England States:								
Maine	4	2	5	204	102	96	1	1
New Hampshire	------	1	------	3	117	22	0	0
Vermont	------	------	------	------	289	5	0	0
Massachusetts	6	3	------	------	144	1,074	0	1
Rhode Island	------	1	------	4	------	188	0	0
Connecticut	7	3	10	1,152	13	307	2	0
Middle Atlantic States:								
New York	19	42	[1] 19	[1] 432	400	280	5	17
New Jersey	22	8	5	356	950	467	2	5
Pennsylvania	54	61	------	------	5,408	90	8	6
East North Central States:								
Ohio	29	41	------	115	976	39	1	6
Indiana	83	20	28	307	547	8	1	3
Illinois	30	23	42	486	3,848	26	0	8
Michigan	7	23	------	139	684	50	3	5
Wisconsin	1	3	37	2,462	835	24	0	1
West North Central States:								
Minnesota	10	------	4	11	17	25	4	0
Iowa	4	5	8	1,564	40	3	0	0
Missouri	29	15	176	1,624	1,344	3	2	0
North Dakota	2	1	3	460	5	1	0	1
South Dakota	------	------	------	266	------	2	0	2
Nebraska	2	------	------	94	5	3	0	0
Kansas	9	7	12	4,988	250	3	0	0
South Atlantic States:								
Delaware	1	1	------	32	8	138	0	0
Maryland [2]	10	7	26	416	15	253	2	7
District of Columbia	8	9	1	143	12	31	1	4
Virginia	21	25	------	------	392	188	1	7
West Virginia	17	6	56	900	307	17	4	6
North Carolina [3]	23	29	35	62	797	59	3	1
South Carolina [3]	4	13	740	861	104	9	0	5
Georgia [3]	11	11	------	470	306	------	3	4
Florida	12	8	5	50	182	6	2	10
East South Central States:								
Kentucky	26	10	54	359	493	51	8	9
Tennessee [3]	13	20	159	746	575	15	3	6
Alabama [3]	17	14	272	899	150	2	4	1
Mississippi [3]	12	6	------	------	------	------	1	1

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 22, 1938, and Jan 23, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Jan. 22, 1938	Week ended Jan. 23, 1937	Week ended Jan. 22, 1938	Week ended Jan. 23, 1937	Week ended Jan. 22, 1938	Week ended Jan. 23, 1937	Week ended Jan. 22, 1938	Week ended Jan. 23, 1937
West South Central States:								
Arkansas	22	3	218	651	149	-------	1	1
Louisiana [3]	15	27	26	193	5	4	2	5
Oklahoma [4]	28	4	177	485	12	3	2	6
Texas [3]	53	67	739	2,421	104	442	0	5
Mountain States:								
Montana	-------	-------	-------	2,706	2	3	0	0
Idaho	-------	-------	2	843	5	71	0	0
Wyoming	-------	-------	-------	-------	2	1	0	0
Colorado	7	3	-------	-------	282	3	0	0
New Mexico	3	-------	2	331	192	32	1	1
Arizona	6	7	96	747	2	172	0	2
Utah [2]	6	1	-------	70	44	16	2	0
Pacific States:								
Washington	1	2	-------	226	46	29	1	1
Oregon	2	-------	56	2,324	8	14	1	0
California	24	42	131	6,210	110	82	1	1
Total	669	574	3,144	36,312	20,258	4,357	72	139
First 3 weeks of year	2,070	1,927	8,372	71,727	49,340	12,000	273	440

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Jan. 22, 1938	Week ended Jan. 23, 1937	Week ended Jan. 22, 1938	Week ended Jan. 23, 1937	Week ended Jan. 22, 1938	Week ended Jan. 23, 1937	Week ended Jan. 22, 1938	Week ended Jan. 23, 1937	Week ended Jan. 22, 1938
New England States:									
Maine	0	0	22	18	0	0	0	21	68
New Hampshire	0	0	17	4	0	0	0	0	10
Vermont	0	0	22	1	0	0	0	0	26
Massachusetts	0	1	270	235	0	0	1	0	107
Rhode Island	0	0	48	43	0	0	0	0	43
Connecticut	0	0	68	99	0	0	1	3	42
Middle Atlantic States:									
New York	2	1	584	783	0	18	4	5	389
New Jersey	0	0	131	131	0	0	5	0	160
Pennsylvania	1	0	509	641	0	0	4	6	344
East North Central States:									
Ohio	2	2	300	289	3	3	2	2	69
Indiana	1	0	277	161	48	4	0	1	17
Illinois	0	1	727	466	51	26	2	8	124
Michigan	0	0	574	659	7	0	1	2	220
Wisconsin	2	0	204	339	13	15	0	1	142
West North Central States:									
Minnesota	0	3	182	141	51	9	2	0	37
Iowa	1	0	280	165	60	12	0	1	42
Missouri	0	0	282	206	70	75	7	1	112
North Dakota	0	0	30	21	26	15	1	0	63
South Dakota	0	0	28	87	10	0	0	0	26
Nebraska	0	0	39	67	1	13	0	0	10
Kansas	1	0	198	256	8	26	2	0	122
South Atlantic States:									
Delaware	0	0	14	4	0	0	0	0	7
Maryland [3]	0	0	62	72	0	0	4	3	62
District of Columbia	0	0	15	18	0	0	3	1	3
Virginia	0	0	51	26	0	0	2	7	93
West Virginia	0	1	68	56	1	0	0	1	128
North Carolina [3]	0	1	41	35	2	0	5	1	326
South Carolina [3]	0	1	7	7	0	0	6	1	47
Georgia [3]	1	3	19	36	0	0	3	7	51
Florida	0	0	9	5	2	0	2	0	14
East South Central States:									
Kentucky	1	0	118	25	33	0	1	3	92
Tennessee [3]	0	1	85	30	7	0	2	4	81
Alabama [3]	3	1	81	9	3	0	5	3	33
Mississippi [3]	1	0	7	9	7	1	0	1	-------

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan 22, 1938, and Jan. 23, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Jan. 22, 1938	Week ended Jan. 23, 1937	Week ended Jan. 22, 1938	Week ended Jan. 23, 1937	Week ended Jan. 22, 1938	Week ended Jan 23, 1937	Week ended Jan. 22, 1938	Week ended Jan. 23, 1937	Week ended Jan. 22, 1938
West South Central States:									
Arkansas	0	1	7	11	[5] 24	0	4	8	64
Louisiana [3]	0	2	22	15	3	0	14	5	3
Oklahoma [1]	1	2	93	25	4	0	6	1	40
Texas [3]	1	0	179	107	24	1	18	11	193
Mountain States:									
Montana	0	0	25	66	12	12	1	0	31
Idaho	0	0	51	24	42	8	2	0	40
Wyoming	0	0	13	8	6	17	0	0	8
Colorado	0	0	63	19	15	1	0	0	7
New Mexico	1	0	25	23	1	0	0	3	32
Arizona	0	0	10	24	2	0	0	0	15
Utah [2]	0	0	86	31	0	0	0	0	29
Pacific States:									
Washington	0	1	62	45	34	4	0	0	138
Oregon	2	1	47	29	31	8	1	0	21
California	1	1	262	270	34	10	5	5	423
Total	22	24	6,218	5,844	638	278	116	116	4,101
First 3 weeks of year	59	71	17,428	17,281	1,834	809	369	392	11,624

[1] New York City only.

[2] Week ended earlier than Saturday.

[3] Typhus fever, week ended Jan. 22, 1938, 16 cases, as follows: North Carolina, 2; South Carolina, 2; Georgia, 3; Tennessee, 1; Alabama, 1; Louisiana, 2, Texas, 5

[4] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

[5] A delayed report from Arkansas includes a report of 10 cases of smallpox for the week ended Jan. 15, 1938.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
December 1937										
California	15	169	189	8	254	5	20	974	102	53
Florida	4	107	34	48	151	1	1	53	3	23
Indiana	2	113	193	--------	292	--------	1	666	219	8
Iowa	2	27	20	--------	37	--------	2	936	171	1
Louisiana	6	76	436	38	6	10	3	50	0	31
Maryland	10	73	69	1	35	1	1	256	0	17
Minnesota	6	18	6	--------	23	--------	13	570	59	9
Mississippi	7	45	5,181	1,160	207	122	7	54	3	3
Montana	--------	2	57	--------	24	--------	1	110	76	8
Nebraska	2	21	--------	--------	8	--------	2	146	5	2
Ohio	29	133	92	--------	1,807	--------	2	1,408	13	11
Oklahoma	12	111	458	25	33	1	6	325	9	18
Oregon	2	18	115	1	57	--------	5	209	37	7
Pennsylvania	20	142	--------	2	10,774	2	6	1,736	0	70
Rhode Island	3	3	--------	--------	7	--------	0	138	0	1
South Dakota	1	3	17	--------	18	--------	3	127	16	0
Virginia	16	128	631	1	467	5	2	197	0	11
Washington	1	21	10	--------	77	--------	3	196	90	4

December 1937

	Cases
Actinomycosis:	
California	1
Anthrax:	
Iowa	4
Chicken pox:	
California	1,974
Florida	129
Indiana	260
Iowa	437
Louisiana	21
Maryland	708
Minnesota	793
Mississippi	623
Montana	461
Nebraska	239
Ohio	1,758
Oklahoma	136
Oregon	321
Pennsylvania	5,299
Rhode Island	108
South Dakota	231
Virginia	323
Washington	752
Conjunctivitis:	
Oklahoma	1
Washington	1
Diarrhea:	
Maryland	9
Ohio (under 2 years; enteritis included)	14
Dysentery:	
California (amoebic)	17
California (bacillary)	45
Florida	1
Louisiana (amoebic)	1
Louisiana (bacillary)	3
Maryland (bacillary)	5
Mississippi (amoebic)	58
Mississippi (bacillary)	181
Montana (bacillary)	1
Ohio (amoebic)	1
Ohio (bacillary)	2
Oklahoma (amoebic)	2
Oklahoma (unspecified)	4
Virginia (amoebic)	3
Virginia (unspecified; diarrhea included)	15
Washington (amoebic)	1
Washington (bacillary)	19
Encephalitis, epidemic or lethargic:	
California	2
Iowa	1
Louisiana	2
Maryland	2
Ohio	3
Oregon	2
Pennsylvania	1
Virginia	1
Food poisoning:	
California	70
Washington	3
German measles:	
California	83
Florida	8
Iowa	2
Maryland	7
Montana	1
Ohio	35
Pennsylvania	93
Rhode Island	4
Washington	13
Granuloma, coccidioidal:	
California	1
Hookworm disease:	
California	1
Florida	1,012
Louisiana	11
Mississippi	555

December 1937—Continued

	Cases
Impetigo contagiosa:	
Maryland	12
Montana	16
Oklahoma	5
Oregon	119
South Dakota	7
Washington	5
Jaundice:	
California	14
Maryland	2
Oregon	16
Lead poisoning:	
Ohio	8
Leprosy:	
California	1
Mumps:	
California	1,267
Florida	8
Indiana	8
Iowa	31
Louisiana	3
Maryland	49
Mississippi	237
Montana	71
Nebraska	61
Ohio	190
Oklahoma	8
Oregon	51
Pennsylvania	2,540
Rhode Island	34
South Dakota	10
Virginia	170
Washington	693
Ophthalmia neonatorum:	
California	5
Louisiana	1
Maryland	2
Mississippi	4
Ohio	44
Oklahoma	2
Pennsylvania	7
Rhode Island	1
Virginia	1
Paratyphoid fever:	
California	2
Louisiana	1
Ohio	1
Puerperal septicemia:	
Mississippi	23
Ohio	3
South Dakota	1
Washington	1
Rabies in animals:	
California	181
Florida	5
Indiana	27
Louisiana	15
Maryland	2
Mississippi	18
Oregon	3
Washington	16
Rabies in man:	
California	1
Mississippi	1
Scabies:	
Maryland	1
Montana	8
Oklahoma	1
Oregon	123
Septic sore throat:	
California	9
Iowa	2
Louisiana	12
Maryland	15
Minnesota	7
Montana	9
Nebraska	1
Ohio	84
Oklahoma	37

December 1937—Continued

	Cases
Septic sore throat—Con.	
Oregon	12
Rhode Island	10
South Dakota	5
Virginia	17
Washington	4
Tetanus:	
California	4
Florida	2
Louisiana	3
Oklahoma	1
Trachoma:	
California	21
Minnesota	2
Mississippi	1
Oklahoma	5
Oregon	4
Pennsylvania	2
South Dakota	6
Trichinosis:	
California	9
Florida	1
Maryland	1
Montana	35
Pennsylvania	2
Tularaemia:	
California	5
Indiana	28
Iowa	9
Louisiana	4
Maryland	12
Montana	2
Ohio	45
Oklahoma	5
Pennsylvania	3
Virginia	13
Typhus fever:	
Florida	9
Undulant fever:	
California	17
Florida	4
Indiana	5
Iowa	8
Louisiana	5
Maryland	3
Minnesota	8
Mississippi	4
Ohio	10
Oklahoma	71
Pennsylvania	7
Rhode Island	1
Virginia	3
Washington	5
Vincent's infection:	
Florida	1
Maryland	9
Oklahoma	2
Oregon	20
Washington	1
Whooping cough:	
California	1,499
Florida	22
Indiana	75
Iowa	113
Louisiana	42
Maryland	248
Minnesota	154
Mississippi	593
Montana	157
Nebraska	45
Ohio	372
Oklahoma	70
Oregon	113
Pennsylvania	1,309
Rhode Island	141
South Dakota	113
Virginia	375
Washington	363

WEEKLY REPORTS FROM CITIES

City reports for week ended Jan. 15, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	231	1,778	205	1,953	1,113	1,752	23	387	21	1,062	--------
Current week [1]	173	246	73	3,165	779	1,682	95	329	18	951	--------
Maine:											
Portland	0	------	0	2	3	0	0	0	0	14	16
New Hampshire:											
Concord	0	------	0	4	1	1	0	0	0	0	6
Manchester	0	------	2	0	1	12	0	0	0	0	23
Nashua	0	------	0	2	2	0	0	0	0	0	9
Vermont:											
Barre	------	------	------	------	------	------	------	------	------	------	------
Burlington	0	------	0	0	0	0	0	0	0	1	12
Rutland	0	------	0	0	1	0	0	0	0	0	7
Massachusetts:											
Boston	3	------	0	53	11	89	0	9	1	21	215
Fall River	0	------	0	0	3	1	0	2	0	18	26
Springfield	0	------	0	0	7	37	0	0	0	8	28
Worcester	0	------	0	0	5	11	0	1	0	12	49
Rhode Island:											
Pawtucket	0	------	0	0	0	4	0	0	0	0	18
Providence	0	------	1	0	11	21	0	4	0	8	78
Connecticut:											
Bridgeport	0	------	0	0	3	19	0	3	0	6	42
Hartford	0	------	0	2	10	14	0	0	0	2	64
New Haven	0	1	0	0	1	3	0	0	0	0	54
New York:											
Buffalo	0	------	2	2	17	24	0	7	0	8	181
New York	81	14	5	72	140	225	0	75	1	147	1,478
Rochester	1	2	0	2	10	8	0	3	0	2	87
Syracuse	0	------	0	0	2	10	0	2	0	10	53
New Jersey:											
Camden	0	------	0	11	2	2	0	0	1	2	38
Newark	3	2	1	4	6	18	0	7	0	15	96
Trenton	0	------	1	43	5	3	0	1	0	8	30
Pennsylvania:											
Philadelphia	8	------	4	211	37	120	0	14	5	34	502
Pittsburgh	1	6	2	333	24	50	0	7	0	31	208
Reading	0	------	0	2	3	7	0	3	0	2	34
Scranton	0	------	--------	32	-------	0	0	-------	0	3	--------
Ohio:											
Cincinnati	2	1	1	1	9	18	0	7	0	0	135
Cleveland	6	26	2	133	22	66	0	11	1	40	244
Columbus	2	------	0	28	2	13	0	4	0	4	85
Toledo	0	1	1	62	6	4	0	2	0	5	63
Indiana:											
Anderson	0	------	0	0	1	3	9	0	1	8	13
Fort Wayne	2	------	0	7	1	8	0	1	0	0	24
Indianapolis	21	------	2	18	12	27	1	4	0	9	103
Muncie	1	------	0	16	2	2	0	0	0	0	15
South Bend	0	------	0	4	3	6	0	0	0	0	16
Terre Haute	1	------	0	1	0	1	0	0	0	0	23
Illinois:											
Alton	0	------	0	5	2	11	0	0	0	0	10
Chicago	13	21	7	690	58	208	0	35	0	42	778
Elgin	0	------	0	1	0	17	0	0	0	0	10
Moline	1	------	0	37	0	15	0	0	0	0	11
Springfield	0	------	0	31	3	9	7	0	0	0	21
Michigan:											
Detroit	7	------	0	275	27	138	0	25	1	46	281
Flint	0	------	0	1	5	39	0	1	0	15	28
Grand Rapids	0	------	0	3	6	20	0	0	0	5	49
Wisconsin:											
Kenosha	0	------	0	1	1	4	0	0	0	3	11
Madison	0	------	0	1	0	4	0	0	0	2	8
Milwaukee	2	2	2	425	15	26	0	6	0	31	122
Racine	0	------	0	2	0	6	0	0	0	2	12
Superior	0	------	0	1	0	0	0	0	0	2	5

[1] Figures for Barre, Vt., and Winston-Salem, N. C., estimated; reports not received.

City reports for week ended Jan. 15, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	0	1	1	10	0	2	1	7	17
Minneapolis	0	------	2	1	7	39	0	0	0	7	106
St. Paul	0	------	0	5	0	5	53	0	0	3	65
Iowa:											
Cedar Rapids	0	------	------	0	------	1	0	------	0	6	------
Davenport	0	------	------	5	------	3	0	------	0	0	------
Des Moines	0	------	------	0	------	29	4	------	0	0	45
Sioux City	0	------	------	1	------	1	0	------	0	1	------
Waterloo	1	------	------	0	------	8	0	------	0	1	------
Missouri:											
Kansas City	0	2	1	64	14	36	1	3	0	13	111
St. Joseph	0	------	0	0	4	3	0	2	0	0	25
St. Louis	5	------	3	260	16	67	4	1	0	3	227
North Dakota:											
Fargo	0	------	0	2	0	9	0	0	0	1	9
Grand Forks	0	------	------	1	0	4	1	------	0	1	------
Minot	0	------	0	0	0	3	0	0	0	21	6
South Dakota:											
Aberdeen	1	------	------	0	------	3	0	------	0	0	------
Sioux Falls	0	------	0	0	0	7	0	0	0	0	10
Nebraska:											
Omaha	4	------	0	0	5	7	0	1	0	1	50
Kansas:											
Lawrence	0	3	0	0	0	0	1	0	0	2	8
Topeka	0	------	1	0	3	5	0	0	0	27	12
Wichita	2	------	0	0	3	4	0	1	0	4	28
Delaware:											
Wilmington	2	------	0	0	3	3	0	0	0	2	26
Maryland:											
Baltimore	4	9	1	7	26	19	0	5	0	31	229
Cumberland	0	------	0	0	1	0	0	0	0	0	12
Frederick	0	------	0	0	1	0	0	0	0	0	4
District of Columbia:											
Washington	4	------	8	7	23	26	0	12	1	9	158
Virginia:											
Lynchburg	2	------	0	0	1	1	0	0	0	1	18
Norfolk	0	------	0	8	4	14	0	0	0	8	26
Richmond	1	------	4	0	5	5	0	2	0	0	62
Roanoke	1	------	0	1	0	1	0	1	0	8	23
West Virginia:											
Charleston	0	1	0	0	2	0	0	0	0	0	19
Huntington	2	------	------	24	------	4	0	------	0	0	------
Wheeling	0	------	0	1	4	6	0	0	0	2	17
North Carolina:											
Raleigh	0	------	0	0	3	0	0	0	0	46	14
Wilmington	0	------	0	3	3	0	0	0	0	7	9
Winston-Salem	------	------	------	------	------	------	------	------	------	------	------
South Carolina:											
Charleston	0	51	2	17	2	1	0	2	1	0	22
Greenville	0	------	0	2	2	0	0	0	0	20	11
Georgia:											
Atlanta	3	19	3	118	7	10	0	6	0	4	90
Brunswick	0	------	0	0	1	0	0	0	0	0	5
Savannah	1	2	1	0	4	1	0	1	1	0	28
Florida:											
Miami	1	1	1	51	2	2	0	2	0	6	36
Tampa	0	------	0	1	2	4	0	0	0	0	18
Kentucky:											
Covington	1	------	0	0	1	1	0	0	0	0	11
Lexington	0	1	1	1	4	2	0	1	0	0	18
Louisville	1	9	0	59	18	84	0	2	0	4	92
Tennessee:											
Knoxville	3	6	0	5	2	1	0	1	0	1	24
Memphis	8	2	1	124	3	9	0	0	0	8	89
Nashville	0	------	0	2	5	1	0	0	0	2	48
Alabama:											
Birmingham	8	20	2	28	5	2	0	3	0	0	89
Mobile	0	1	1	2	2	1	0	0	0	0	20
Montgomery	0	5	------	4	------	1	0	------	0	1	------
Arkansas:											
Fort Smith	0	------	------	2	------	0	0	------	------	10	------
Little Rock	1	------	0	30	8	2	0	2	0	0	12
Louisiana:											
Lake Charles	0	------	0	0	1	0	0	1	0	0	11
New Orleans	12	24	7	0	40	13	0	10	2	0	203
Shreveport	1	------	0	1	5	6	0	1	1	0	43

City reports for week ended Jan. 15, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Oklahoma:											
Muskogee	1	------	------	0	------	0	0	------	0	1	------
Oklahoma City	1	------	1	0	3	6	0	0	0	0	39
Tulsa	1	------	------	0	------	7	2	------	0	11	------
Texas:											
Dallas	2	5	5	0	13	10	0	8	0	0	70
Fort Worth	0	------	0	1	7	10	0	2	0	0	48
Galveston	0	------	0	0	3	1	0	0	0	0	15
Houston	3	1	0	0	5	8	0	5	0	0	73
San Antonio	1	------	1	0	8	0	0	3	0	0	55
Montana:											
Billings	0	------	0	1	3	0	0	0	0	0	7
Great Falls	0	------	0	0	3	1	1	0	0	13	10
Helena	0	------	0	0	0	1	0	0	0	3	3
Missoula	0	------	0	0	0	1	0	0	0	0	7
Idaho:											
Boise	0	------	0	0	1	0	18	0	0	0	9
Colorado:											
Colorado Springs	0	------	0	0	2	1	0	0	0	0	15
Denver	8	------	0	90	12	16	1	3	0	3	101
Pueblo	0	------	0	0	1	1	1	0	0	2	8
New Mexico:											
Albuquerque	0	------	0	22	2	1	0	3	0	4	13
Utah:											
Salt Lake City	0	------	1	10	5	15	0	0	0	7	41
Washington:											
Seattle	0	------	0	2	6	6	1	2	0	41	95
Spokane	0	------	0	0	2	1	1	0	0	3	33
Tacoma	0	------	0	0	2	7	5	1	0	19	29
Oregon:											
Portland	3	2	0	0	7	27	1	0	0	0	77
Salem	0	1	------	0	------	1	0	------	0	0	------
California:											
Los Angeles	10	26	1	8	28	50	1	13	0	22	347
Sacramento	1	------	0	0	3	0	0	1	0	43	28
San Francisco	1	------	3	3	6	9	0	9	0	57	191

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Boston	1	1	0
New York:			
Buffalo	2	1	0
New York	1	1	1
New Jersey:			
Camden	1	0	0
Pennsylvania:			
Philadelphia	1	0	0
Ohio:			
Cleveland	1	1	0
Indiana:			
Anderson	1	1	0
Illinois:			
Alton	0	0	1
Chicago	2	0	0
Michigan:			
Detroit	1	0	0
Minnesota:			
Duluth	1	0	0
Kansas:			
Wichita	1	0	0

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
District of Columbia:			
Washington	1	0	0
Kentucky:			
Louisville	1	0	0
Tennessee:			
Knoxville	1	2	0
Alabama:			
Birmingham	2	1	0
Arkansas:			
Little Rock	0	1	0
Louisiana:			
New Orleans	1	0	0
Colorado:			
Denver	0	1	0
Washington:			
Spokane	1	1	0
California:			
Los Angeles	2	1	0
San Francisco	1	0	0

Encephalitis, epidemic or lethargic.—Cases: Providence, 1; New York, 1; Minneapolis, 1.

Pellagra.—Cases: Atlanta, 6; Brunswick, 1; Birmingham, 1.

Rabies in man.—Deaths: Atlanta, 1.

Typhus fever.—Cases: Charleston, S. C., 2; Savannah, 1; Mobile, 1; Houston, 1. Deaths: Mobile, 1; Houston, 1.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—2 weeks ended January 1, 1938.—During the 2 weeks ended January 1, 1938, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis				1	1	1				3
Chicken pox		2	1	217	404	143	36	34	86	923
Diphtheria		7	5	103	14	6	10		1	145
Dysentery					1					1
Erysipelas				7	5	5	4	1	8	30
Influenza		59			54	2			93	208
Measles		56	29	158	511	29	74	55	302	1,214
Mumps		1			160	31		6	9	207
Paratyphoid fever					10				1	11
Pneumonia		1			34				11	46
Poliomyelitis				1	3		4	1	1	10
Scarlet fever		30	10	206	208	64	78	45	33	674
Trachoma							1		1	2
Tuberculosis		23	9	73	53	92	2		20	272
Typhoid fever			2	68	4	3	1	1	11	90
Undulant fever				2	2			1		5
Whooping cough		9		204	130	42	45		31	461

EGYPT

Infectious diseases—First quarter 1937.—During the first quarter of 1937 certain infectious diseases were reported in Egypt as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax		1	Plague		14
Cerebrospinal meningitis	75	60	Poliomyelitis	3	1
Chicken pox	431	1	Puerperal septicemia	96	82
Diphtheria	215	122	Rabies	10	10
Dysentery	404	63	Scarlet fever	15	
Erysipelas	924	191	Smallpox	1	
Influenza	2,073	155	Tetanus	97	65
Jaundice, epidemic		1	Tuberculosis (pulmonary)	1,098	617
Leprosy	86	12	Typhoid fever	808	177
Lethargic encephalitis	1		Typhus fever	491	86
Malaria	5,945	28	Undulant fever	4	1
Measles	2,106	289	Whooping cough	493	21
Mumps	286	2			

Vital statistics—First quarter 1937.—Following are vital statistics for Egypt for the first quarter of 1937:

Number of live births	56, 855
Live births per 1,000 inhabitants	48. 9
Number of stillbirths	1, 115
Number of deaths	27, 531
Deaths per 1,000 inhabitants	23. 7
Deaths under 1 year of age	6, 905
Deaths under 1 year of age per 1,000 live births	121

LATVIA

Vital statistics—Year 1936.—Following are vital statistics for Latvia for the year 1936:

Population	1, 950, 502
Marriages	16, 550
Births	35, 468
Births per 1,000 population	18. 09
Deaths	27, 646
Deaths per 1,000 population	14. 10
Deaths under 1 year of age per 1,000 births	8. 01

UNION OF SOUTH AFRICA

Natal—Durban—Undetermined outbreak involving paralysis.—A report dated January 20, 1938, states that an outbreak of a disease in the form of a paralysis has occurred in Durban, where 36 cases have been reported. Every member of the vessel *Jean L D* that visited Durban in October 1937 has been afflicted. The disease is stated to be of low virulence.

VIRGIN ISLANDS

Notifiable diseases—October–December 1937.—During the months of October, November, and December, 1937, certain notifiable diseases were reported in the Virgin Islands as follows:

Disease	October	November	December	Disease	October	November	December
Diphtheria		2		Pellagra	1	1	1
Filariasis	1			Pneumonia	5	2	3
Gonorrhea	16	14	18	Schistosomiasis	1	2	4
Hookworm disease	1	3	11	Syphilis	10	8	18
Leprosy	1			Tetanus		1	2
Malaria		12	30	Tuberculosis	2	2	4

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for January 28, 1938, pages 144-159. Similar cumulative tables will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

China—Hong Kong.—During the week ended January 15, 1938, 1 case of cholera was reported in Hong Kong, China.

Dutch East Indies—Celebes—Macassar.—During the week ended January 15, 1938, 1 case of cholera was reported in Macassar, Celebes, Dutch East Indies.

India (French)—Pondichery Territory.—During the week ended December 18, 1937, 1 case of cholera was reported in Pondichery Territory, French India.

Indochina (French).—During the week ended January 15, 1938, 12 cases of cholera were reported in Annam Province, and 7 cases of cholera in Tonkin Province, French Indochina.

Plague

Boliva—Tarija Department.—A report dated January 25, 1938, states that 50 cases of bubonic plague have occurred in Tarija Department, Bolivia.

Ecuador—Guayas Province—Colimes.—During the week ended January 8, 1938, 1 case of plague was reported in Colimes, Guayas Province, Ecuador.

Hawaii Territory—Island of Hawaii—Hamakua District—Paauhau Sector.—A rat found on January 14, 1938, one rat found on January 15, and another rat found on January 17, 1938, in Paauhau Sector, Hamakua District, Island of Hawaii, Hawaii Territory, have been found plague infected.

Smallpox

China—Canton—Hong Kong.—From December 1, 1937, to February 1, 1938, 65 cases of smallpox have been reported from one hospital in the city of Canton.

During the week ended January 25, 1938, 75 cases of smallpox with a mortality of 70 percent were reported in Hong Kong, China.

Venezuela—Puerto Cabello.—A report dated January 10, 1938, states that 16 cases of smallpox (alastrim) were unofficially reported in Puerto Cabello, Venezuela.

Typhus Fever

Sierra Leone.—On December 4, 1937, 1 case of typhus fever was reported in Sierra Leone.

Yellow Fever

Brazil—Santa Catharina State—Joinville.—On December 2, 1937, 1 death from yellow fever was reported in Joinville, Santa Catharina State, Brazil.

Colombia.—Yellow fever has been reported in Colombia as follows: Boyaca Department—Muzo, 1 death on December 13, 1937; Santander Department—Puerto Wilches, 1 death on December 21, 1937.

Dahomey—Cotonou.—During the period December 11–20, 1937, 5 suspected cases of yellow fever were reported in Cotonou, Dahomey.

Gambia—Georgetown.—On January 10, 1938, 1 suspected case of yellow fever was reported in Georgetown, Gambia.

UNITED STATES TREASURY DEPARTMENT

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IN THIS ISSUE

Harmful Industrial Dusts and Methods of Control
Production of Dibenzanthracene Tumors in Mice
Effect of Heredity on Induced Lung Tumors in Mice

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THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg Gen. ROBERT OLESEN, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PUBLIC HEALTH REPORTS

VOL. 53 FEBRUARY 11, 1938 NO. 6

HARMFUL INDUSTRIAL DUSTS[1]

By R. R. SAYERS, *Senior Surgeon, United States Public Health Service*[2]

While dusts exist everywhere in the atmosphere, it has been recognized for centuries that workers in certain dusty occupations are less healthy than those not so exposed. The number of persons exposed in dusty occupations comprises one of the largest industrial groups. The occupational diseases of workers in dusty atmospheres have been found to be due to entrance of dust into the system by inhalation, by ingestion, by direct absorption through the skin, by irritation of the skin, or by a combination of the foregoing.

The suspensions of particulate matter in air have been broadly termed dusts, fumes, and smokes. Such a classification is necessarily arbitrary, since the line of demarcation between them is not very sharp, and the chief differentiation is based on the size of the particles. Investigations by the Public Health Service in dusty industries (*1*) revealed that about 70 percent of the dust particles examined were between 1 and 3 microns in size, only about 20 percent were less than 1 micron, and the median size was 1.3 microns. Industrial dusts are mainly less than 10 microns in size. However, fibrous dusts in the air, such as asbestos, have been found to contain particles as large as 200–400 microns in the greatest diameter.

While we cannot agree with Collis that, generally speaking, dusts are more injurious as their chemical composition differs from that of the human body, or from the elements of which the body is normally composed (*2*), it is difficult to establish a comprehensive definition for *toxic* dusts. Sollmann (*3*), after analysis of various definitions for poison, felt that it was very difficult to give a definition which would not be ambiguous in some cases, but believed that the following covered most of the points which must be considered in classifying a substance as such:

> A poison is any substance which, acting directly through its inherent chemic properties, and by its ordinary action, is capable of destroying life, or of seriously endangering health, when it is applied to the body, externally, or in moderate doses (to 50 gm) internally.

Some dusts are known to be poisonous, while others, in the concentrations usually encountered, are comparatively harmless. However, it may be stated that *breathing* dust in high concentration is not desirable.

---

[1] Presented before the National Safety Congress, Kansas City, Mo, Oct 13, 1937.

[2] Division of Industrial Hygiene of the National Institute of Health.

According to Fairhall, the damage arising from the inhalation of toxic dust may be either local or remote, and depends upon whether the material is a protoplasmic poison, whether it is caustic in reaction, or whether it is absorbed into the blood stream and carried to other centers which are in turn affected (*4*).

It is now well established that exposure to certain kinds of dusts, such as those containing considerable quantities of free silica, has increased the morbidity and mortality rate from respiratory disease; while metallic dusts, such as lead and its compounds, have been associated with general systemic poisoning (*5*). Dust may be swallowed with saliva, water, or food, and direct poisoning has been traced to absorption by this method; other dusts may act as irritants and produce affections of the skin, irritate mucous membranes of nose, eyes, and throat, often causing inflammatory diseases of these organs (*6*).

Some inorganic dusts are able to penetrate the deep lung tissues and are sufficiently insoluble to be retained there. Some of these may be active in the human tissues, causing definite and permanent injury, while others are inert and may be retained for years, apparently without serious damage; some are gradually absorbed without causing pathological changes (*7*).

Most inhaled particles are soluble, at least to a small extent. If harmless, cell activity is stimulated so that phagocytes remove the dust. If the solute is toxic, the viability of the phagocyte is affected and an ineffective accumulation results. At the same time, further solute may diffuse into neighboring tissues, setting up an irritation and subsequent fibrosis. The nature as well as the solubility of the solute is an important factor, but of two substances of approximately equal toxicity, the more soluble form causes the greater damage. However, substances of such low solubility as silica may ultimately produce extensive injury (*4*).

Kettle has stated that harmful dusts, if inhaled into the lungs, may activate a latent tuberculous infection; they may exaggerate an active tuberculous lesion or a coincident infection. If a harmless dust is inhaled in sufficient quantities, some of it remains in the lungs and causes a mild degree of fibrosis merely through mechanical irritation, but such fibrosis is never sufficient to interfere with the function of the lung (*8*).

Some writers state that while the influence of nonpoisonous dusts on health is a debatable subject, abnormally high death rates from bronchitis and pneumonia are sometimes attributed to chronic exposure to nontoxic dusts. Large amounts of dust are occasionally found in supposedly normal lungs at autopsy (*9*).

According to Drinker, there are four different types of reaction produced in man by the inhalation of dust. The first and most important are the pneumoconioses, such as silicosis and asbestosis, which cause specific lung pathology and often are followed by pulmonary tuberculosis. The second type of reaction is caused by toxic dusts, like lead, cadmium, and radium. A third type of malady follows the inhalation of finely divided metallic fume particles, such as zinc oxide, and is known as metal fume fever. The fourth reaction, allergic in character, is caused by breathing organic dusts, such as pollen and certain types of pulverized wood and flour. In all four cases the sole cause of the disability may be dust inhalation, but the reactions from toxic dusts result from swallowing as well as from inhalation (*10*).

For various reasons it is difficult to set up an absolute classification for dusts. Opinion is rapidly changing regarding so-called inert or harmless dusts and further investigation may prove some of them to be injurious. Some dusts may have both a toxic and an irritant action; while, on the other hand, the poisoning resulting from exposure to a dust may be the combined effect of more than one mode of entrance into the body. However, the following classification of dusts, according to physical characteristics and physiological effect, is used for convenience.

I. ORGANIC DUSTS

Organic dusts are those which contain carbon, and were originally supposed to come from organized substances derived from animal or plant life. Living dusts come under this classification and are thought to be of the same order of size as industrial dusts, with which they are frequently associated. Bacteria are usually between 0.5 and 3 microns, except in a few cases, such as the anthrax bacillus, which ranges from 1 to 1.25 micron in breadth and 4.5 to 10 microns in length. Spores of fungi may range in size from less than 1 micron to 20 microns in length and up to 12 microns in diameter. However, it is possible that the larger and heavier varieties, like the larger and heavier dust particles, settle by gravity, and do not remain suspended in the air.

Many thousands of organic substances, carbon-containing, are made synthetically by chemical processes, such as dyestuffs, explosives, and similar substances.

1. NONLIVING ORGANIC DUSTS

As the name implies, these are composed of nonviable particles, which may or may not be inherently toxic or irritant, but which nevertheless produce untoward effects in the human organism. "Allergic" dusts, or those to which only certain persons are or may become hypersensitive, with resulting asthma, rhinitis, or other disturbances, are included in this classification.

(*a*) *Toxic and* (*or*) *irritant dusts.*—Toxic or irritant dusts are all organic dusts which produce untoward symptoms, either systemic or local. Those producing local symptoms are usually described as irritant; those producing general or systemic symptoms are termed toxic. A dust may be both toxic and irritant.

In reported cases of injury or death following inhalation of dust from organic compounds, among the chief offenders are paranitraniline, the dinitrobenzenes, chlorodinitrobenzenes, trinitrophenol, and nitronaphthalene. Eye damage due to nflammation of the cornea has occurred among workers exposed to methyl violet dust. The dust from paraphenylene diamine derivatives is particularly irritating and dangerous, causing not only a severe form of dermatitis where the dust comes in contact with the skin, but also producing acute inflammation of the mucous membrane of the respiratory passages (*4*). Toxic dusts may be generated during the handling of powdered dyes and in preliminary dyeing operations, particularly the hydro-extractor process, where particles are disseminated in all directions (*11*). Coal tar and indigo dyes are substances most frequently used.

Cases of amblyopia have been reported from exposure to inhalation of tobacco dust (*12*). It has been found that inhaled tobacco dust exerts a nicotine action on the organism 15 times greater than that produced by the same quantity of smoked tobacco with an equal nicotine content (*13*).

Severe dermatitis is experienced by many workers handling powder containing TNT, which is used in making high explosives. Picric acid, which is also used for this purpose, requires drying, and in this latter state it has been found to produce a dermatitis. Picric acid is also the oldest synthetic organic dyestuff (*14*). Dermatitis occurs among handlers of silk with varying frequency. Salls determined that a rash occurring among workers in a silk factory was due to dust from silk cocoons imported from Africa (*15*).

Persons engaged in the manufacture of quinine and quinine preparations suffer from skin phenomena, which occur for the most part on exposed parts of the body, and may be caused by ingestion or by quinine dust, or powder form of the preparation, exerting a direct irritating effect on the skin (*16*). Dermatitis due to other vegetable dusts such as vanilla, powdered arnica, pyrethrum, etc., has been reported (*14*).

Dental lesions, of occupational origin, have been reported among workers in sugar. The gingivitis caused by sugar dust is classified as purely mechanical, with later-developing caries. Digestive disorders, respiratory conditions, and cutaneous conditions (especially of the face) have also been reported (*17*).

Dock workers, transporters of grain, workers in grain and flour mills, and persons in similar occupations are exposed to dusts during their work. Dusts from cereals may contain many impurities, which may cause an irritating action on the respiratory passages, as well as inflammation of the skin. Digestive disturbances, dental defects, diminution in hearing, and conjunctivitis have been observed among millers, and have been attributed to the dusts to which such workers are exposed (*18*).

(*b*) *Allergic.*—Many apparently innocuous substances may produce reactions in persons of peculiar personal susceptibility. The term "allergy" is used to describe this condition of hypersensitiveness, or susceptibility, and allergic phenomena most frequently manifest themselves in skin reactions. However, they may cause acute reactions elsewhere in the body. When the respiratory tract is involved we have such well-known diseases as hay fever or asthma. These diseases may develop as a result of hypersensitiveness to such substances as pollens from plants, horsehair, furs, feathers, and the like. For instance, furriers, workers in clothing industries who are exposed to wool dust, and others may suffer from hay fever or asthma (*19*). It is unnecessary for the offending dust to reach the depths of the lungs (giant pollens, for example, are reported to produce their effect after being caught in the upper respiratory passages). Should such an offending substance be finely ground, it could reach the alveoli and as a result probably all physiologic reactions would be accelerated (*20*).

In a survey of a plant where resin is mixed, ground, and molded, it was found that 80 percent of the occupational dermatitis there was due to hypersensitivity to hexamethylenetetramine and formaldehyde contained in the dust to which the workers were exposed (*21*). During the first processes of cotton spinning, cotton-strippers are exposed to dust arising from cotton husks and debris, which produces a typical form of asthma (*2*).

Ordinary wood dust has been of interest, owing to its purely mechanical action; but still greater care is required in handling certain kinds, especially woods coming from abroad, because of the essential oils impregnating them, which when freed in the dust may affect the health of the workers concerned. Some of the woods capable of causing skin lesions are Brazil wood, satinwood, teakwood, cumaru or tonka wood, black ebony wood, West Indian mahogany, Japanese tagayasan, coccoloba, chestnutwood, olivewood, and California sequoia (redwood). All persons who handle these woods are not injured, only those particularly susceptible to the substances they contain becoming affected (*22*).

2. LIVING ORGANIC DUSTS

Living organic dusts contain particles capable of exhibiting the phenomena of life (*2*) (especially the property of reproduction or multiplication), such as bacteria and fungi. They are usually found in low concentrations and are associated with nonliving dusts in the air.

(*a*) *Bacteria.*—One of the most important among these is the anthrax bacillus, which is contained in the dust from skins, furs, wool, and animal hair, horns, hoofs, bones, and similar animal products. This disease may occur in two forms; namely, *cutaneous* (in which the organism affects the skin) and *pulmonary* (when it is inhaled, as in the form of anthrax known as wool-sorters' disease) (*12*).

Cases of tetanus reported in connection with jute manufacture were traced to the raw material, the bacillus having been found in the factory dust (*23*). Diphtheria, tuberculosis, smallpox, typhoid, and other bacillus-produced diseases, may result from exposure to infected dusts.

Bacterial sensitization can be the cause of any of the allergic diseases; namely, asthma, perennial hay fever, urticaria, angioneurotic edema, eczema, or migraine headaches (*24*).

(*b*) *Fungi.*—Dusts containing the mycelia and spores of parasitic fungi give rise to annoyance and discomfort. "Maltster's" itch from the dust alone has been reported. In Provence, reeds used for ceilings are stacked while still wet and undergo fermentation; they become covered with a white powder (a dry fungus of the Mucor family, *Sporotrichum dermatodes*), which is scattered when the bark is stripped off. This powder is irritating to the skin and mucous membranes. Mycelia and spores of molds are commonly found to cause rashes; an example is the black powder coming from macerated sugarcane stalks. Among basket makers, the mycelium and spores, in the form of a white mold (hyphomycete) from the rattan canes used, get shaken out when the canes are split, hammered, and cut, causing painful fissures to develop on the skin where they alight (*14*).

A form of asthma or spasmodic cough, suffered by cotton weavers and known as aspergillosis, has been considered due to inhalation of spores of a mildew which sometimes occurs on the threads (*23*). In a study of silicosis among miners, made by the Public Health Service, a number of cases of typical miliary calcification were encountered. Unstained smears from those cases examined were positive for fungus, two types of *Aspergillus* fungi being identified. All of the subjects but one were farmers, teamsters, feedmill workers, or residents of small agricultural towns where grain is marketed. Farmers are exposed to fungi in threshing wheat, baling hay, or handling various small grains (*25*).

Some other fungus diseases, such as actinomycosis and blastomycosis, are associated with occupational exposure to dust. The former occurs among workers handling straw, hay, grass, vegetable debris contaminated with mold, and similar material. Actinomycosis is likely to affect people engaged in commercial handling, storing, and cleansing of grain (grain distilleries, flour mills, grain crushing, breweries, and malting houses, etc.) (*26*).

II. INORGANIC DUSTS

Inorganic compounds are of mineral origin, not requiring a living organism to produce them (*27*). A number of dusts not usually classed as toxic may, under some conditions, produce untoward effects on the human organism. Classified under inorganic are toxic and (or) irritant, fibrosis-producing and non-fibrosis-producing dusts.

(*a*) *Toxic and* (*or*) *irritant.*—Toxic dusts are those which are inherently toxic when inhaled, ingested, or otherwise absorbed. Among those which produce systemic poisoning, some of which are also irritant, are the dusts from heavy metals and their salts, such as lead, mercury, arsenic, cadmium, zinc, and similar metals. Irritant dusts are injurious by reason of their strong irritative or corrosive properties. As a rule, inhaled irritant substances immediately cause a reaction in the upper respiratory tract of such severity that they are prevented from reaching the lungs, although they may cause lung damage by extension of inflammation if the mucous membrane is corroded (*7*). Lime, calcium oxide, and the dichromates are examples of irritant dusts. An inorganic dust may possess both toxic and irritant properties, and the poisoning produced may be the combined effect of more than one mode of entrance into the body.

Of the directly poisonous dusts, the most widely prevalent are those of certain lead compounds, particularly the oxide, carbonate, and the chromate. The dust is readily absorbed by the mucous membrane; some dust passes into the stomach and is dissolved by the gastric juice (*6*).

According to Fairhall, perforated nasal septum is a common occurrence among workers with bichromate dusts (*4*). In a study made by the United States Public Health Service it was found that continuous daily exposure to concentrations of chromic acid mist greater than 1 milligram in 10 cubic meters is likely to cause definite injury to the nasal tissues (*28*). It is believed that a similar concentration of the dust would be equally toxic.

In the case of poisoning from some heavy metals, there may be exposure to both dust and vapor. For instance, investigations have shown the safe limit of *total* exposure to lead oxide dust and fumes to be less than 1.5 mg per 10 cubic meters of air, except for prolonged exposure (*29*). In exposure to mercury dust and vapor, it was shown that the incidence of chronic mercurialism increased rapidly with increasing mercury concentration, after such concentration exceeds 2.0 mg per 10 cubic meters (*30*).

Alkalis and metallic oxides are common causes of dermatoses. Lye, potash, and lime are known to cause irritation to plasterers, cement makers, bricklayers, masons, stonecutters, modelers, and metal platers (*16*). Ulceration and perforation of the nasal septum occur among workers exposed to the dust of soda ash; systemic poisoning also occurs from inhalation of calcium cyanimide dust (*21*).

Cases of dermatitis, scleroderma, and cancer are reported to have been caused by exposure to dust of arsenic compounds. Certain aluminum salts are skin irritants, and aluminum dusts may contribute to the infection of skin and mucous membranes, through mechanical action (*16*).

(*b*) *Fibrosis-producing dusts.*—The most important of these are the inorganic, slightly soluble dusts which cause fibrous changes in the lung tissues, some of which are serious, and some of which cause little or no disability (*7*). So far as is known, no inorganic substances other than silicon derivatives cause more than a very moderate degree of fibrosis of the lung. Moreover, there seems to be no evidence that any other constituent of ordinary dusts can influence so unfavorably a pulmonary infection (*8*).

Although other dusts, when inhaled in sufficient concentrations over a long enough period of time, have been shown to be capable of producing a pulmonary fibrosis, nevertheless, the pneumoconiosis characterized by nodular fibrosis has to date been shown clinically and experimentally to be associated only with the inhalation of dusts containing free silica. Since this dust, to exert its harmful action, must enter the finer divisions of the lung, the particle size of the atmospheric dust may bear a definite relationship to the injurious effect produced. The silica must be present in the air in particles small enough to enter the finer air spaces and of such dimensions that the phagocytic cells may engulf them. The greater majority of particles found upon microscopic examination of the lung fall within the limits of from 1 to 3 microns (*31*). Examples of siliceous dusts are granite, quartz, sand, pumice, slate, and similar substances.

In a recent study among anthracite miners, the correlations between exposures to dust (which contained silica) and the evidence of constitutional changes left little doubt as to the etiological significance of the dust in the air breathed. Like correlations were found between the silica exposure and the extent of pulmonary changes (*32*). When the inhaled dust consists of silica combined with bases, silicates, some degree of change in the pulmonary tissue may result. In this respect asbestos dust seems to be unique among silicates in the prevalence and severity of the disease it causes (*33*).

The chief distinction between silicosis and conditions due to simple reactions caused by other dusts is the active proliferative reaction in the tissues which results in progressive nodulation. Silicosis, when once established, strongly predisposes the lungs to infection, especially with the tubercle bacillus. Chronic interstitial pneumonia, chronic bronchitis, and emphysema are frequent complications of advanced degrees of silicosis.

The relation of the acute respiratory infections to the reaction due to dusts other than free silica has never been established, though a heightened incidence has often been shown statistically in workers in dusty trades. It is fairly certain that a dust-damaged lung, whatever the cause, fares much worse if an acute infection does supervene upon it (*7*).

In a study conducted by the Public Health Service among marble finishers in Vermont, it was found that marble dust, when inhaled in the concentrations found in the examined plants, produced a mild, bilateral, linear fibrosis in some cases, but no serious lung changes were noted and there was no disability due to the dust, even after years of exposure (*34*).

(*c*) *Non-fibrosis-producing dusts.*—These are inert, that is, they do not cause fibrous tissue to be produced, but may become encapsulated or lie free in the tissues, or they are absorbed without production of fibrous tissue. Included among them are alundum, coal, corundum, emery, limestone, magnesite, marble, plaster of paris (gypsum), and polisher's rouge.

DUST CONTROL

Engineering and medical control are the two most important factors in combating the industrial dust hazard, and are to a large extent complementary.

Engineering control.—As Lanza (*35*) has stated in a recent paper, "It is a basic principle in dealing with a dust hazard that the dust should be attacked at its point of origin and thus prevented from being disseminated into the atmosphere." After the dust has been spread throughout the air it is difficult to deal with it, and reliance must be placed on individual protection, which is never wholly satisfactory.

Lanza further cites various methods used in controlling dust. These will be reviewed but briefly here.

Dust may be entrapped at its source by suction devices and thus removed and collected. Familiar examples are exhaust hoods in grinding operations and the devices used in rock drilling. Generally speaking, the exhaust ventilation method, where applicable, is to be preferred in controlling a dust hazard. Water may be used to entrap dust and prevent its dispersal, and under certain circumstances it may be of advantage to combine the use of water and the use of suction. Sometimes a dusty process can be completely enclosed in a sealed room or compartment. It must be remembered, however, that any mechanical device of this kind offers adequate protection only if it is properly designed, installed, and maintained.

A great deal of attention has been given the subject of individual protection from dust, and there are many types of respiratory protective devices now available. These are generally of two types—those which provide fresh air from an uncontaminated source and those which rely upon a filtering medium for removing dust from the air breathed. Where the use of such a device is indicated, only one of the types approved by the United States Bureau of Mines should be used. As a rule, it may be said that masks, respirators, or other such protective devices should be used only where exposure to the dust is intermittent and brief, or where some unusual condition makes a more adequate dust control impracticable (*35*).

Where bacteria or other living dusts in the air are associated with a process, sterilization methods, such as increased temperature, ultraviolet radiation, and chemicals like chlorine or other bactericidal substances, may be of use. Pasteurization temperature (about 140° F.) will kill most organisms except those bearing spores. Steam disinfection is used for horsehair, and proves to be practicable if the temperature does not exceed 230° F. Wool fibers, however, lose their elasticity by steam disinfection, and the "Duckering" process now used in England includes soaking of the wool in a formaldehyde solution, and drying in a current of air at a temperature of 160° F. (*12*). There are but few occupations in which there would be a sufficient concentration of dead bacteria to cause untoward effects in man.

In the case of dusts producing external irritation, auxiliary protective measures may include the use of protective clothing, gloves, goggles, and aprons, as well as protective salves, ointments, or other compounds to delay or diminish the irritant action. General rules for hygiene and good housekeeping should also be observed.

Medical control.—Equally important, and closely interrelated with the engineering phase, is medical control of occupational hazards. In addition to directing the proper placement of new workers and guarding the health of all employees, medical control is a check on the efficacy of the engineering control methods already instituted, or a measure of the need for new protective devices.

It has been stated that "Industry has found that the best way to treat industrial injuries and illness is to prevent them" (*36*), and medical control, through preemployment and periodic physical examinations, is one of the most important factors in such prevention.

The preemployment examination is made to determine the employee's physical and mental fitness for work. It serves to disclose the presence of any contagious disease, reveals any minor physical defects which might later become serious, or whether the examinee's condition precludes his employment in certain or in all types of work. It should be remembered that such preemployment examinations are not to be made for the purpose of eliminating or excluding an employee, but rather for allocating him to the type of work for which he is physically suited. A worker should be given employment unless totally unfit, or unless his disability would cause him to be a hazard to himself or his associates. Furthermore, the practice of preemployment examinations should be extended to include executives and officials of industrial organizations.

"The purpose of periodic physical examinations is to secure and maintain physical fitness and thereby lengthen work spans" (*36*). Reexamination of employees sometimes results in the discovery of defects and disabilities which were not observed at the time of employment. In such cases an occupational adjustment should be made to provide continued employment, and remove the risk of permanent injury. Reexamination of employees is required by law in certain occupations in which the handling of poisonous or otherwise deleterious substances may result in the contraction of disease (*37*). Since some occupational diseases tend to clear up and recur, records of previous occupations should be included in the physical examinations. The frequency of examinations should be determined by the medical director, unless otherwise specified by law. Those exposed to known occupational disease hazards may have weekly or monthly examinations (*36*).

"It should always be kept in mind that the basic principle of physical examinations in industry is to keep men on the job and not allow the physical examination to be merely a weeding out process" (*35*).

REFERENCES

(*1*) Bloomfield, J. J., and Dalla Valle, J. M.: The determination and control of industrial dust. Public Health Bulletin No. 217. U. S. Govt. Printing Office, Wash., D. C., April 1935.

(*2*) Collis, Edgar L.: Industrial pneumoconioses, with special reference to dust phthises. Milroy Lectures, 1915. H. M. S. O., London.

(*3*) Sollmann, Torald: A manual of pharmacology. W. B. Saunders & Co., Philadelphia, 1932.

(*4*) Fairhall, Lawrence T.: Toxic dusts and fumes. J. Ind. Hyg. and Toxicol., November 1936.

(*5*) Bloomfield, J. J.: The sampling and analysis of industrial dusts. American Public Health Association Yearbook, 1935–36

(*6*) Gibbs, W. E.: Dust hazard in industry. Ernest Benn, Ltd. London, 1925.

(*7*) Air Hygiene Foundation of America, Inc. Silicosis and allied disorders. Medical series, Bulletin No. 1 Pittsburgh, Pa., April 15, 1936.

(*8*) Kettle, E. H.: The action of harmful dusts. Inst. of Mining and Metallurgy, London, June 14, 1934.

(*9*) Dusts, fumes, and smokes. Occupation and health series, International Labour Office, Geneva, 1930.

(*10*) Drinker, Philip: Causation of pneumoconiosis. J. Ind. Hyg. and Toxicol., October 1936.

(*11*) Dyeing. Occupation and health series, International Labour Office, Geneva, 1930.

(*12*) Legge, Sir Thomas: Industrial maladies. Oxford University Press, London, 1934.

(*13*) Burstein, A.: Nicotine action from inhaled tobacco dust. J. Ind. Hyg., December 1927.

(*14*) White, R. Prosser: The dermatergoses, or occupational affections of the skin. H. K. Lewis & Co. Ltd., London, 1934.

(*15*) Schwartz, Louis: Skin hazards in American industry. Public Health Bulletin No. 215. Govt. Printing Office, Wash., D. C., October 1934.

(*16*) Downing, J. G.: Industrial dermatoses: Treatment and legal aspects: Review of recent literature. J. Ind. Hyg. and Toxicol., July 1935.

(*17*) Occupational lesions in workers in sugar. Belgium Letter, J. Am. Med. Assoc., Sept. 10, 1927. Abst. *in* J. Ind. Hyg., February 1928.

(*18*) Flour mills. Occupation and health series, International Labour Office, Geneva, 1930.

(*19*) Mayers, May R.: Susceptibility to dermatitis. Ind. Bull., Albany, N. Y., Vol. 16, No. 2, February 1937.

(*20*) Drinker, Philip, and Hatch, Theodore. Industrial dust. McGraw-Hill Book Company, Inc., New York, 1936.

(*21*) Schwartz, Louis: Skin hazards in American industry. Part II. Public Health Bulletin No. 229. Govt. Printing Office, Wash., D. C., September 1936.

(*22*) Poisonous woods. Occupation and health series, International Labour Office, Geneva, 1930.

(*23*) Hope, E. W., Hanna, W., and Stallybrass, C. O.: Industrial medicine and hygiene. Bailliere, Tindall, and Cox, London, 1923.

(*24*) Brown, G. T.: The diagnosis of bacterial allergy. Southern Med. J., Vol. 27, No. 10, October 1934.

(*25*) Sayers, R. R., and Meriwether, F. V.: Miliary lung disease due to unknown cause. Pub. Health Rep., Dec. 5, 1930.

(*26*) Actinomycosis. Occupation and health series, International Labour Office, Geneva, 1930.

(*27*) Holland, J. W.: Textbook of medical chemistry and toxicology. W. B. Saunders Company, Philadelphia, 1920.

(*28*) Bloomfield, J. J., and Blum, Wm.: Health hazards in chromium plating. Pub. Health Rep., Sept. 7, 1928.

(*29*) Russell, Jones, Bloomfield, Britten, and Thompson: Lead poisoning in a storage battery plant. Pub. Health Bull. No. 205. Govt. Printing Office, Wash., D. C., June 1933.

(*30*) Neal, Jones, Bloomfield, DallaValle, and Edwards: A study of chronic mercurialism in the hatters' fur cutting industry. Pub. Health Bull. No. 234. Govt. Printing Office, Wash., D. C., May 1937.

(*31*) Sayers, R. R., and Jones, R. R.: Silicosis and similar dust diseases. National Silicosis Conference, Washington, D. C., Apr. 14, 1936.

(*32*) Sayers, Bloomfield, DallaValle, Jones, Dreessen, Brundage, and Britten: Anthraco-silicosis among hard coal miners. Pub. Health Bull. No. 221. Govt. Printing Office, Wash., D. C., December 1935.

(*33*) Middleton, E. L.: Industrial pulmonary disease due to the inhalation of dust. The Lancet, July 4 and 11, 1936.

(*34*) Dreessen, Waldemar C.: Effect of inhaled marble dust as observed in Vermont marble finishers. Pub. Health Rep., June 22, 1934.

(*35*) Lanza, A. J.: Control and prevention of silicosis. Symposium on silicosis. California Tuberculosis Association, San Francisco, 1937.

(*36*) Newquist, M. N.: Medical service in industry and workmen's compensation laws. American College of Surgeons, Chicago, 1934.

(*37*) Medical care of industrial workers. National Industrial Conference Board, Inc. New York, 1926.

THE PRODUCTION OF TUMORS IN MICE OF STRAINS C_3H AND *Y* BY DIBENZANTHRACENE AND METHYLCHOLANTHRENE[1]

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It has been shown (*1*) that subcutaneous injections of a lard solution of 1:2:5:6-dibenzanthracene induces sarcomas at the site of injection in pure-strain mice In this laboratory mice of various inbred strains have been given subcutaneous injections of lard-dibenzanthracene solutions and, until the experiments recorded in this paper, mice of strain *CBA* have proved to be the most resistant (*2*) of all strains. Boyland and Warren (*5*) found strain *CBA* mice to be less susceptible to the carcinogenic action of methylcholanthrene than the "Simpson Albino strain" of mice The object of this brief report is to record experimental evidence showing that mice of strain *Y* are also very resistant to the carcinogenic action of both 1:2:5:6-dibenzanthracene and methylcholanthrene.

EXPERIMENTAL ANIMALS

Mice of two strains were used, all of which were bred in these laboratories. The establishment of the C_3H strain has been recorded by Strong (*7*) and their susceptibility to spontaneous growths, as observed in this laboratory, has been reported (*3*) previously. Of the pure-strain mice which have been injected subcutaneously with 1:2:5:6-dibenzanthracene in this laboratory, mice of strain C_3H have, thus far, responded to the injections by developing tumors earlier than any other strain.

Mice of strain *Y* were the offspring from a litter procured from the Roscoe B. Jackson Memorial Laboratories and the strain has been described by Dr. C. C. Little (*6*) of that laboratory. The mice are of yellow, brown, or black coat color and have been inbred by brother-to-sister mating for approximately 10 years. They have a low incidence of spontaneous mammary gland tumors and a medium incidence of "internal tumors."

EXPERIMENTAL

The first indication of the resistance of strain *Y* mice to the carcinogenic power of 1:2:5:6-dibenzanthracene was from the results obtained by injecting mice of strain *Y* and strain C_3H in two different experiments. Both strains, however, were injected with the same lard solution of the hydrocarbon. The experiment is described below:

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[1] From the Office of Cancer Investigations, U S Public Health Service, Harvard Medical School, Boston, Mass

Experiment 1.—On November 1, 1935, 25 strain *Y* mice (13 females and 12 males), consisting of 17 yellow, 5 brown, and 3 black animals, were each injected subcutaneously in the right axilla with 0.2 cc of a lard-solution of 1:2:5:6-dibenzanthracene containing 4 mg of the hydrocarbon dissolved in each cc of lard. The injections were repeated on November 15, 1935. Each animal thus received 1.6 mg of the compound dissolved in 0.4 cc of lard.

On November 15, 1935, each of 36 strain C_3H male mice received a single subcutaneous injection in the right axillary region, consisting of 0.8 mg of the compound dissolved in 0.2 cc of lard. The use of these mice has been recorded as experiment 4 in an earlier communication (*4*).

It will be noted that the strain *Y* mice received twice the amount of the carcinogenic agent that the strain C_3H animals received, and, as stated before, the same lard solution of the hydrocarbon was used to inject all mice of both strains. The results of the experiments are presented in table 1, where it is seen that the mice of strain C_3H developed tumors earlier than did those of strain *Y*. The average time of appearance of tumors in strain C_3H mice was 19.2 weeks, while for mice of strain *Y* it was 26.1 weeks.

Experiment 2.—In this experiment mice of both strains were tested for their susceptibility to lard solutions of 1:2:5:6-dibenzanthracene and methylcholanthrene. Lard solutions containing 4 mg of hydrocarbon in each cc were prepared by Dr. M. J. Shear, who also supplied the methylcholanthrene for the experiment. On December 23, 1936, 37 strain C_3H mice and 35 black strain *Y* mice each received a single subcutaneous injection in the right axilla of 0.2 cc of a lard solution containing 0.8 mg of one of the hydrocarbons. Of these, 17 strain C_3H males and 17 strain *Y* mice (10 males and 7 females) were injected with the lard solution of 1:2:5:6-dibenzanthracene while 20 strain C_3H males and 18 strain *Y* females were given the lard solution of methylcholanthrene.

The first tumors were noted in methylcholanthrene-injected strain C_3H mice on February 17, 1937, just 8 weeks after injection. The first tumor resulting from the injection of 1:2:5:6-dibenzanthracene was observed in a strain C_3H mouse on March 3, 1937, or 12 weeks after injection. So far as the *Y* mice were concerned, the first tumor was noted in a methylcholanthrene-injected mouse on April 8, 1937, or 16 weeks after injection, while of the dibenzanthracene-injected animals, none had developed a tumor 9 months after injection. The time of appearance of tumors is recorded in table 1.

TABLE 1.—*Experiments 1 and 2: Time of appearance of induced tumors in mice of strains C_3H and Y following subcutaneous injection of lard solutions of 1:2:5:6-dibenzanthracene or methylcholanthrene*

Time in weeks					8	10	12	14	16	18	20	22	24	26	28	30	32	34	Total number of tumors	Number dying without tumor	Number living and tumor-free on September 1, 1937
Experiment No.	Strain of mice	Hydrocarbon injected	Amount of hyrdrocarbon injected	Number of mice injected	Number of tumors																
			Mg																		
1	*Y*	Dibenzanthracene.	1.6	25	---	---	---	1	---	1	---	1	5	4	5	---	3	1	21	4	0
1	C_3H	do	.8	36	---	---	---	5	6	6	7	6	3	---	2	---	--	---	35	1	0
2	*Y*	do	.8	17	---	---	---	---	---	---	---	--	---	---	---	---	---	---	0	8	9
2	C_3H	do	.8	17	---	---	1	---	2	3	4	2	1	1	1	---	---	---	15	2	0
2	*Y*	Methylcholanthrene.	.8	18	---	---	---	---	2	---	2	1	1	---	2	---	1	1	10	2	6
2	C_3H	do	.8	20	11	4	1	3	---	---	---	---	---	---	---	--	---	---	19	1	0

The findings in the two experiments reveal clearly that mice of strain *Y* are more resistant than those of strain C_3H to the carcinogenic power of both hydrocarbons. Attention is directed to the fact that 0.8 mg of 1:2:5:6-dibenzanthracene failed to evoke tumors in strain *Y* mice within 36 weeks after injection, while the average time of appearance of tumors in strain C_3H mice after injection was 20 weeks. It should be mentioned that of the 8 mice of strain *Y* which died following the injection of 1:2:5:6-dibenzanthracene, 7 died prior to March 3, 1937, at which time the first tumor was noted in a strain C_3H animal. These 7 mice were males and died from wounds caused by fighting. Of the 10 remaining strain *Y* mice, one died, tumor-free, 30 weeks after injection and the other 9 were living and free from tumor on September 1, 1937.

The results attending injection of methylcholanthrene also revealed a difference in susceptibility between the strains, for the average time in which tumors appeared in the C_3H mice was 9.6 weeks, while for the *Y* mice, it was 24 weeks. Furthermore, six strain *Y* mice were living and were without tumor on September 1, 1937.

Little (*6*) found that in hybrid mice derived by crossing strains *Y* and *D* (dilute brown) the yellow animals had a lower incidence of mammary tumors than did the nonyellows. The results of the experiments recorded herein fail to give any information as regards the relation of coat color of strain *Y* mice to susceptibility to induced tumors, for most of the mice of experiment 1 were of yellow coat color and received 1.6 mg of 1:2:5:6-dibenzanthracene, while all the mice of experiment 2 were black and received 0.8 mg of the carcinogenic compounds. The results obtained in the yellow strain *Y* mice of experiment 1 failed to reveal any influence exerted by sex upon the appearance of induced subcutaneous growths.

So far as strain C_3H mice are concerned it is shown that they respond very early to the cancer-inducing power of methylcholanthrene, which is known to be highly carcinogenic, for 0.8 mg of the compound induced tumors in 75 percent of them within 10 weeks after injection, which indicates that these mice are very susceptible to carcinogenic hydrocarbons other than 1:2:5:6-dibenzanthracene.

SUMMARY

Mice of strains *Y* and C_3H have been tested for susceptibility to lard solutions of 1:2:5:6-dibenzanthracene and methylcholanthrene by subcutaneous injections. It was found that mice of strain *Y* are far more resistant than those of strain C_3H to the carcinogenic power of both hydrocarbons.

REFERENCES

(*1*) Andervont, H. B.: The production of dibenzanthracene tumors in pure strain mice. Pub. Health Rep., **49:** 620 (1934).

(*2*) ———— Further studies on the production of dibenzanthracene tumors in pure strain and stock mice. Pub. Health Rep., **50:** 1211 (1935).

(*3*) Andervont, H. B., and McEleney, W. J.: Incidence of spontaneous tumors in a colony of strain C_3H mice. Pub. Health Rep., **52:** 772 (1937).

(*4*) Andervont, H. B., and Lorenz, E.: Dibenzanthracene tumors in mice. The production of subcutaneous, pulmonary, and liver tumors by serum dispersions and lard solutions. Pub. Health Rep., **52:** 637 (1937).

(*5*) Boyland, E., and Warren, F. L.: The induction of tumors by methylcholanthrene in two strains of mice. J. Path. and Bact., **45:** 171 (1937).

(*6*) Little, C. C.: The relation of coat color to the spontaneous incidence of mammary tumors in mice. J. Exp. Med., **59:** 229 (1934).

(*7*) Strong, L. C.: The establishment of the C_3H inbred strain of mice for the study of spontaneous carcinoma of the mammary gland. Genetics, **20:** 586 (1935).

PULMONARY TUMORS IN MICE

V. FURTHER STUDIES ON THE INFLUENCE OF HEREDITY UPON SPONTANEOUS AND INDUCED LUNG TUMORS[1]

By H. B. ANDERVONT, *Biologist, United States Public Health Service*

In an earlier publication (*1*) experimental evidence was presented which showed that the susceptibility of the lungs of certain mice to the formation of tumors induced by subcutaneous injections of a lard-dibenzanthracene solution is inherited as a dominant character. Reciprocal cross-breeding was carried out between a strain of mice exhibiting a high incidence of spontaneous pulmonary tumors (strain *A*) and a strain in which very few such growths appear (strain *C* 57 black), and the progeny of this mating were designated as of the first hybrid generation. Females of the first hybrid generation were then mated to male litter mates to procure animals designated as of the second hybrid generation. When the hybrid mice were injected subcutaneously with a lard-dibenzanthracene solution, 90 percent of the first generation and 74.7 percent of the second generation developed lung nodules.

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[1] From the Office of Cancer Investigations, U. S. Public Health Service, Harvard Medical School, Boston, Mass.

Further studies on the inheritance of susceptibility to both spontaneous and induced pulmonary neoplasms in mice are reported in this paper. There are also included the results of experiments in which lard solutions of 1:2:5:6-dibenzanthracene were removed from injected mice and reinjected into other mice. This latter work is recorded herein because mice of the second hybrid generation were used as a source of material to be reinjected. This report is, therefore, divided into three sections, as follows: (1) The influence of heredity upon the development of spontaneous lung tumors in outcross mice; (2) the influence of heredity upon the development of induced lung tumors in back-cross mice; (3) the ability of a lard-dibenzanthracene solution to induce tumors after previous injection into other mice.

THE INFLUENCE OF HEREDITY UPON THE DEVELOPMENT OF SPONTANEOUS LUNG TUMORS IN OUT-CROSS MICE

This part of the paper may be regarded as a continuation of the earlier publication (*1*) in which hybrid mice were injected subcutaneously with the carcinogenic compound dissolved in lard. The animals included herein were set aside as normal uninjected controls at that time. As stated previously, mice of the first hybrid generation were procured by mating mice of strains *A* and *C* 57 black on July 15, 1935, and there were 179 black offspring born between August 15 and October 5, 1935. Most of these mice were injected with the carcinogenic compound, but 30 females, born between August 15, 1935, and September 15, 1935, were set aside as normal controls. Four of them died prior to March 1, 1937, and were not autopsied because they had been eaten by other mice. Of the 26 remaining mice, 11 were sacrificed on July 23, 1936, when they were approximately 11.5 months old; 10 of them were tumor-free and 1 had a single pulmonary growth. The remaining 15 mice were kept until March 1, 1937, when they were approximately 18 months of age, and then killed and their lungs examined carefully for the presence of macroscopic tumor growth. Fourteen had pulmonary tumors and 1 was negative.[2]

Mice of the second hybrid generation were derived by mating females of the first hybrid generation to male litter mates on October 30, 1935. There were 665 animals obtained from this mating, and, of these, 89 which were born between November 20, 1935, and December 15, 1935, were set aside as normal controls. The color and sex of the control mice of the second hybrid generation were divided as follows:

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[2] It has been observed that the majority of strain *A* mice show cystic degeneration of the kidneys when 18 months of age. None of the first hybrid generation mice of this experiment showed similar lesions.

	Female	Male	Total
Black	18	15	33
Albino	16	19	35
Brown	8	13	21
Total	42	47	89

Two of these mice died when 6.5 months of age; both were free from tumor growth. Twenty-six were killed on July 23, 1936, when they were approximately 8 months old; 25 were tumor-free and 1 had a single pulmonary growth. Nine died between July 23, 1936, and March 8, 1937; all were negative so far as lung tumors were concerned. The remaining 52 mice were all sacrificed on March 8, 1937, when they were about 16 months old; 20 were lung-tumor free and 32 had macroscopic lung nodules.

The findings in the hybrid generations confirm the observations of Lynch (*4*, *5*), as well as those of Bittner and Little (*3*), who have shown that, in mice, susceptibility to spontaneous lung neoplasms is inherited according to genetic principles. This is of special interest in view of recent evidence (*3*) that spontaneous mammary cancer in mice may be caused by an extra-chromosomal influence.

THE INFLUENCE OF HEREDITY UPON THE DEVELOPMENT OF INDUCED LUNG TUMORS IN BACK-CROSS MICE

In order to procure back-cross animals, female mice of the first hybrid generation were mated to males of strain *A* or strain *C* 57 black on June 24, 1936. Twenty-four progeny were obtained from mating hybrids back to the strain *A* parent stock; these are called strain *A* back-cross, or *ABC* mice. There were 42 offspring resulting from mating hybrids back to the strain *C* 57 black parent stock; these are designated as strain *C* 57 back-cross, or *BBC* mice.

All the 66 back-cross mice received a subcutaneous injection of a lard-dibenzanthracene solution in the right axillary region on October 9, 1936, each mouse receiving 1 mg of 1:2:5:6-dibenzanthracene in 0.25 cc of lard.

The first subcutaneous tumor was noted on January 12, 1937, approximately 14 weeks after injection. Between January 12, 1937, and March 19, 1937, 20 of the *ABC* and 26 of the *BBC* animals developed subcutaneous sarcomas at the site of injection. As these mice died or were killed their lungs were examined for the presence of macroscopic tumor growths. On March 19, 1937, there were 4 *ABC* and 16 *BBC* mice alive and free from tumor at the site of injection. All these were sacrificed and their lungs examined for the presence of tumor; all 4 *ABC* mice had multiple lung tumors, while 8 of the *BBC* animals had from 1 to 6 tumors in their lungs and the remaining 8 were free from tumor. The results of the experiment are presented in table 1.

TABLE 1.—*Subcutaneous and lung tumors in strain A back-cross and strain C 57 black back-cross mice following subcutaneous injection of a lard-dibenzanthracene solution*

	Strain *A* back-cross	Strain *C* 57 black back-cross
No subcutaneous or lung tumors	0	8
Subcutaneous tumors only	0	15
Lung tumors only	4	8
Both subcutaneous and lung tumors	20	11
Total	24	42

In table 1 it is seen that all of the 24 *ABC* and 19, or 45 percent, of the *BBC* mice developed pulmonary growths. All the *ABC* mice had "multiple nodules" within their lungs, a term used in this laboratory to designate lungs with 15 or more macroscopic tumors upon their surfaces, while in the 19 *BBC* animals with lung tumors there was a total of 101 such growths, an average of 5.3 tumors for each set of positive lungs. From these findings it is concluded that the lungs of the *BBC* mice were more resistant than those of the *ABC* mice to the development of tumors induced by the lard solution of 1:2:5:6-dibenzanthracene. The results are in harmony with those of Lynch (*6*) who utilized tar painting to demonstrate the inheritance of lung tumor susceptibility in back-cross mice and found that it was inherited as a dominant character.

The appearance of induced lung growths in 45 percent of the *BBC* mice in the experiment recorded above suggests that but one dominant factor may be involved in the inheritance of susceptibility to induced tumor when mice of strains *A* and *C* 57 black are used as test animals.

THE ABILITY OF A LARD-DIBENZANTHRACENE SOLUTION TO INDUCE TUMORS AFTER PREVIOUS INJECTION INTO OTHER MICE

As stated before (*1*), mice of the second hybrid generation were given 0.8 mg of 1:2:5:6-dibenzanthracene, dissolved in 0.2 cc of lard, subcutaneously in the right axilla on January 22, 1936, and the injection was repeated on February 5, 1936. Thus, each mouse received 1.6 mg of 1:2:5:6-dibenzanthracene dissolved in 0.4 cc of lard. On July 23, 1936, 6 months after the first injection, 62 of these animals were killed, 43 of which were free from tumor at the site of the subcutaneous injection. Because part of the injected material was present in the subcutaneous tissues of some of the animals which did not have macroscopic tumors, it was considered of interest to determine whether it retained its cancer-inducing power. Recovery of the material was accomplished by drawing it through a 20-gage needle attached to a 0.5 cc calibrated syringe in which the amount was measured.

Two experiments were performed. In the first, material withdrawn from a mouse of the hybrid generation was measured, and injected immediately into the subcutaneous tissues of the right axillary region of a strain C_3H mouse. Animals of strain C_3H were used because experiments in this laboratory (*2*) have shown them to be very susceptible to the carcinogenic activity of 1:2:5:6-dibenzanthracene and, in addition, they had not been used as a parent stock from which the hybrids had been derived. The use of a foreign strain of mice reduced the possibility of obtaining tumors because of the presence of tumor cells within the injected material, for geneticists have shown that, as a rule, a tumor arising within a member of a strain of mice of known genetic constitution will not grow when implanted into members of another strain. Material was procured from 9 of the second hybrid generation mice and used to inject 9 males of strain C_3H. The amounts injected varied from 0.05 to 0.1 cc.

Subcutaneous sarcomas arose at the site of injection in 7 of the strain C_3H mice, the first appearing within 4 months and the last within 8 months after injection. The 2 surviving mice were killed and found to be free from tumor 10 months after injection.

In the second experiment material was withdrawn from 6 of the hybrid mice on July 23, 1936, pooled, and heated at 100° C. for 5 minutes in order to kill any living cells which were present in the lard. After cooling, the material was used to inject 5 strain C_3H mice, each animal receiving 0.1 cc subcutaneously in the right axilla. Four of these mice developed subcutaneous sarcomas at the site of injection; the first was noted 6 months and the last 9 months after injection.

These results show that the lard solution retained its ability to evoke tumors in strain C_3H mice after it had remained in the bodies of the hybrid mice for a period of 6 months.

CONCLUSIONS

Out-cross mice, procured by reciprocal matings between strain *A* mice which have a high incidence of spontaneous pulmonary growths and strain *C* 57 black mice in which very few such growths appear, developed spontaneous pulmonary tumors in accordance with genetic principles.

Back-cross mice, obtained by mating hybrids back to their strain *A* and strain *C* 57 black parent stocks inherited a susceptibility to pulmonary tumors induced by subcutaneous injection of a lard-dibenzanthracene solution, but the strain *A* back-cross mice were more susceptible than the strain *C* 57 black back-cross mice.

A lard solution of 1:2:5:6-dibenzanthracene produced tumors in the subcutaneous tissues of strain C_3H mice after remaining within the bodies of hybrid mice for a period of 6 months.

REFERENCES

(*1*) Andervont, H. B.: Pub. Health Rep., **52**: 304 (1937).
(*2*) Andervont, H. B.: Pub. Health Rep., **50**: 1211 (1935).
(*3*) Bittner, J. J., and Little, C. C.: J. Heredity, **28**: 117 (1937).
(*4*) Lynch, C. J.: J. Exp. Med., **43**: 339 (1926).
(*5*) Lynch, C. J.: J. Exp. Med., **54**: 747 (1931).
(*6*) Lynch, C. J.: J. Exp. Med., **46**: 917 (1927).

DEATHS DURING WEEK ENDED JANUARY 22, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Jan. 22, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	8,991	[1] 10,578
Average for 3 prior years	9,970	
Total deaths, first 3 weeks of year	27,519	33,230
Deaths under 1 year of age	523	[1] 626
Average for 3 prior years	600	
Deaths under 1 year of age, first 3 weeks of year	1,624	1,990
Data from industrial insurance companies:		
Policies in force	69,764,818	68,976,571
Number of death claims	14,031	16,701
Death claims per 1,000 policies in force, annual rate	10.5	12.6
Death claims per 1,000 policies, first 3 weeks of year, annual rate	9.7	11.7

[1] Data for 85 cities.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (----) indicate that cases or deaths may have occurred although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 29, 1938, and Jan. 30, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Jan. 29, 1938	Week ended Jan. 30, 1937	Week ended Jan. 29, 1938	Week ended Jan. 30, 1937	Week ended Jan. 29, 1938	Week ended Jan. 30, 1937	Week ended Jan. 29, 1938	Week ended Jan. 30, 1937
New England States:								
Maine	----	3	2	374	143	50	0	0
New Hampshire	----	----	10	1	62	12	0	0
Vermont	----	----	----	----	264	----	0	0
Massachusetts	2	5	----	----	192	863	0	4
Rhode Island	----	----	----	9	----	124	0	1
Connecticut	2	1	6	984	10	347	1	0
Middle Atlantic States:								
New York	33	40	[1] 14	[1] 208	564	296	11	7
New Jersey	12	10	12	163	1,011	440	1	5
Pennsylvania	37	48	----	----	5,953	84	9	10
East North Central States:								
Ohio	41	21	----	731	1,574	65	3	12
Indiana	83	21	13	322	340	13	1	4
Illinois	41	32	35	220	3,915	23	5	7
Michigan	18	19	1	83	971	44	1	2
Wisconsin	3	2	44	1,227	944	19	0	0
West North Central States:								
Minnesota	3	5	4	14	9	34	0	1
Iowa	29	4	----	556	95	----	4	0
Missouri	19	20	145	2,000	933	4	2	4
North Dakota	3	----	3	225	18	----	0	2
South Dakota	3	2	----	216	----	2	0	0
Nebraska	----	----	4	78	1	2	1	1
Kansas	7	9	25	3,640	553	6	1	1
South Atlantic States:								
Delaware	1	1	----	----	11	97	0	0
Maryland [2]	17	17	47	471	26	338	3	4
District of Columbia	9	7	3	130	12	32	0	2
Virginia	12	45	----	----	398	183	5	4
West Virginia	10	2	38	236	256	12	7	3
North Carolina [3]	30	33	47	34	976	54	5	3
South Carolina [3]	5	9	711	827	150	44	1	1
Georgia [3]	16	13	----	600	310	----	2	3
Florida	20	17	13	40	102	7	4	5
East South Central States:								
Kentucky	5	9	46	359	473	51	10	9
Tennessee	10	15	185	653	525	0	3	5
Alabama [3]	23	27	362	466	215	6	8	1
Mississippi [2]	5	8	----	----	----	----	2	0

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 29, 1938, and Jan. 30, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Jan. 29, 1938	Week ended Jan. 30, 1937	Week ended Jan. 29, 1938	Week ended Jan. 30, 1937	Week ended Jan. 29, 1938	Week ended Jan. 30, 1937	Week ended Jan. 29, 1938	Week ended Jan. 30, 1937
West South Central States:								
Arkansas	13	7	190	864	196	3	1	1
Louisiana [3]	10	9	22	235	3	4	4	0
Oklahoma [4]	21	9	217	505	13	32	2	2
Texas [3]	73	50	719	2,435	60	324	3	0
Mountain States:								
Montana	--------	1	--------	3,343	6	4	0	0
Idaho	4	2	6	230	3	73	1	0
Wyoming	--------	--------	--------	30	9	1	0	0
Colorado	10	7	--------	--------	174	3	0	1
New Mexico	4	4	1	930	157	26	0	0
Arizona	4	1	130	1,154	2	191	0	1
Utah [2]	6	2	--------	7	54	154	1	0
Pacific States:								
Washington	4	13	4	415	21	69	0	2
Oregon	3	--------	53	2,187	9	7	1	1
California	31	30	144	9,893	174	50	1	11
Total	691	580	3,256	37,101	21,929	4,190	104	120
First 4 weeks of year	2,761	2,507	11,628	108,828	71,269	16,790	377	560

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Jan. 29, 1938	Week ended Jan. 30, 1937	Week ended Jan. 29, 1938	Week ended Jan. 30, 1937	Week ended Jan. 29, 1938	Week ended Jan. 30, 1937	Week ended Jan. 29, 1938	Week ended Jan. 30, 1937	Week ended Jan. 29, 1938
New England States:									
Maine	0	0	22	21	0	0	5	0	55
New Hampshire	0	0	13	5	0	0	0	0	3
Vermont	0	0	13	10	0	0	0	0	31
Massachusetts	0	0	286	249	0	0	2	0	141
Rhode Island	0	0	28	74	0	0	0	0	59
Connecticut	0	0	92	108	0	0	0	0	39
Middle Atlantic States:									
New York	1	0	677	788	0	3	7	5	462
New Jersey	1	1	139	172	0	0	0	3	187
Pennsylvania	1	1	569	650	0	0	6	7	284
East North Central States:									
Ohio	0	2	486	438	8	8	2	0	149
Indiana	0	0	195	193	42	2	1	0	33
Illinois	3	2	837	551	84	32	2	8	112
Michigan	0	1	560	666	4	0	1	3	195
Wisconsin	0	0	221	348	12	13	0	2	198
West North Central States:									
Minnesota	1	0	178	147	35	5	0	0	53
Iowa	0	0	224	191	46	24	2	1	47
Missouri	1	0	231	234	48	97	8	1	49
North Dakota	0	0	28	29	23	20	0	0	80
South Dakota	0	2	13	116	3	4	0	0	23
Nebraska	0	2	47	70	2	2	0	0	8
Kansas	0	0	250	291	25	11	0	1	99
South Atlantic States:									
Delaware	0	0	14	12	0	0	0	1	10
Maryland [3]	1	0	67	57	0	0	2	1	44
District of Columbia	0	0	15	16	0	0	0	0	5
Virginia	0	1	41	30	0	0	2	8	109
West Virginia	0	0	51	47	0	0	1	3	143
North Carolina [3]	1	0	62	47	1	2	6	9	419
South Carolina [3]	0	0	1	6	0	0	1	2	44
Georgia [3]	0	1	11	16	0	0	3	3	66
Florida	1	0	11	11	1	0	1	1	22

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Jan. 29, 1938, and Jan. 30, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Jan. 29, 1938	Week ended Jan. 30, 1937	Week ended Jan. 29, 1938	Week ended Jan. 30, 1937	Week ended Jan 29, 1938	Week ended Jan. 30, 1937	Week ended Jan. 29, 1938	Week ended Jan. 30, 1937	Week ended Jan. 29, 1938
East South Central States:									
Kentucky	2	0	85	24	34	0	2	3	49
Tennessee	0	1	32	26	2	0	3	9	30
Alabama [3]	1	0	31	14	0	2	1	2	31
Mississippi [2]	1	0	4	4	4	0	2	2	
West South Central States:									
Arkansas	1	2	9	7	12	2	3	3	41
Louisiana [3]	1	1	16	5	0	0	4	4	6
Oklahoma [4]	0	1	49	22	29	0	3	1	38
Texas [3]	3	2	136	108	30	2	13	9	136
Mountain States:									
Montana	0	0	43	35	7	7	0	0	21
Idaho	0	0	29	39	30	2	1	0	50
Wyoming	0	0	14	5	2	0	0	0	14
Colorado	0	0	33	28	4	0	0	0	12
New Mexico	0	1	12	18	0	0	3	0	36
Arizona	0	0	11	33	0	0	3	0	55
Utah [2]	0	0	83	23	1	5	0	0	46
Pacific States:									
Washington	2	0	99	80	45	10	1	1	121
Oregon	0	3	70	15	11	18	0	0	28
California	4	2	221	306	30	4	4	8	405
Total	26	26	6,359	6,385	575	275	95	101	4,294
First 4 weeks of year	85	97	23,787	23,606	2,409	1,144	464	493	15,918

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[1] New York City only.

[2] Week ended earlier than Saturday.

[3] Typhus fever, week ended Jan. 29, 1938, 36 cases, as follows: North Carolina, 2; South Carolina, 2; Georgia, 10; Alabama, 8; Louisiana, 1; Texas. 13.

[4] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week·

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
July 1937										
New Hampshire		3	1				3	21	0	1
August 1937										
New Hampshire		1					10	2	0	1
September 1937										
Vermont		4			22		13	12	0	10
Wisconsin	5	20	118		145		157	209	1	20
December 1937										
Alabama	31	108	746	92	66	10	6	87	1	14
Hawaii Territory		4	18		38		3		0	6
Illinois	20	158	116	10	4,365		12	2,315	111	9
Kansas	7	47	43		237		1	791	44	6
Nevada	3	1	9		3		0	5	0	0
New Mexico	2	27	9	1	306		1	107	0	22
New York	35	134		10	558		5	1,818	0	36
North Dakota	1	6	33		74		0	113	51	0
Texas	18	201	1,714	768	257	82	18	422	15	97
Wisconsin	1	11	141		523		1	610	17	2

Summary of monthly reports from States—Continued

	Cases
July 1937	
New Hampshire:	
Paratyphoid fever	1
September 1937	
Vermont:	
Chickenpox	14
German measles	1
Mumps	172
Undulant fever	2
Whooping cough	72
Wisconsin:	
Chickenpox	217
Dysentery (amoebic)	1
Encephalitis, epidemic or lethargic	2
German measles	52
Mumps	111
Septic sore throat	14
Tularaemia	1
Undulant fever	9
Whooping cough	967
December 1937	
Actinomycosis:	
Illinois	1
Chickenpox:	
Alabama	134
Hawaii Territory	35
Illinois	2, 176
Kansas	997
Nevada	32
New Mexico	101
New York	2, 657
North Dakota	139
Texas	341
Wisconsin	1, 624
Dengue:	
Texas	41
Dysentery:	
Alabama (amoebic)	1
Illinois (amoebic)	5
Illinois (amoebic carriers)	13
Illinois (bacillary)	31
Kansas (bacillary)	1
New Mexico	2
New York (amoebic)	8
New York (bacillary)	97
Texas (bacillary)	43
December 1937—Con.	
Encephalitis, epidemic or lethargic:	
Alabama	2
Hawaii Territory	1
Illinois	6
Kansas	2
New York	9
Texas	1
Wisconsin	2
German measles:	
Alabama	2
Illinois	75
Kansas	13
New Mexico	1
New York	76
Wisconsin	35
Hookworm disease:	
Hawaii Territory	14
Impetigo contagiosa:	
Hawaii Territory	19
Illinois	14
Jaundice, infectious:	
Hawaii Territory	4
Mumps:	
Alabama	41
Hawaii Territory	7
Illinois	492
Kansas	562
Nevada	176
New Mexico	8
North Dakota	11
Texas	72
Wisconsin	330
Ophthalmia neonatorum:	
New York	7
Paratyphoid fever:	
Hawaii Territory	1
New Mexico	1
New York	5
Texas	2
Puerperal septicemia:	
Nevada	1
New Mexico	1
Rabies in animals:	
Alabama	72
Illinois	28
New Mexico	1
Rabies in man:	
Alabama	1
Illinois	1
Septic sore throat:	
Hawaii Territory	1
Illinois	6
December 1937—Con.	
Septic sore throat—Con.	
Kansas	6
New Mexico	7
New York	80
North Dakota	1
Wisconsin	18
Tetanus:	
Alabama	5
Hawaii Territory	2
Illinois	3
Kansas	1
New York	6
Trachoma:	
Alabama	2
Hawaii Territory	3
Illinois	59
Trichinosis:	
Hawaii Territory	4
New York	3
Tularaemia:	
Illinois	39
Kansas	9
New Mexico	2
Wisconsin	1
Typhus fever:	
Alabama	27
Hawaii Territory	5
Illinois	1
Texas	20
Undulant fever:	
Alabama	2
Hawaii Territory	1
Illinois	12
Kansas	18
New York	19
Texas	11
Wisconsin	5
Vincent's infection:	
Illinois	23
Kansas	13
New York	68
Whooping cough:	
Alabama	107
Hawaii Territory	25
Illinois	334
Kansas	310
Nevada	4
New Mexico	93
New York	1, 493
North Dakota	79
Texas	582
Wisconsin	506

WEEKLY REPORTS FROM CITIES

City reports for week ended Jan. 22, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	232	1,780	207	2,434	1,114	1,865	27	308	21	1,145	--------
Current week	163	221	73	5,258	800	1,648	46	365	20	1,040	--------
Maine:											
Portland	1	------	0	1	6	1	0	0	0	31	27
New Hampshire:											
Concord	0	------	0	8	3	0	0	0	0	2	16
Manchester	0	------	0	0	4	8	0	0	0	0	14
Nashua	0	------	0	0	2	0	0	1	0	8	17
Vermont:											
Barre	0	------	0	19	0	0	0	0	0	0	1
Burlington	0	------	0	1	0	0	0	0	0	1	10
Rutland	0	------	0	0	2	0	0	0	0	0	18
Massachusetts:											
Boston	0	------	2	92	12	82	0	10	0	9	207
Fall River	0	------	0	0	5	6	0	0	0	21	37
Springfield	0	------	0	1	2	2	0	0	0	4	42
Worcester	0	------	0	0	7	9	0	4	0	8	54
Rhode Island:											
Pawtucket	0	------	0	0	0	3	0	0	0	0	16
Providence	0	------	0	0	7	31	0	6	0	13	72
Connecticut:											
Bridgeport	0	------	0	0	3	17	0	0	0	1	40
Hartford	0	4	0	0	5	12	0	0	0	5	38
New Haven	0	1	0	0	2	0	0	0	0	3	32
New York:											
Buffalo	0	------	0	2	13	32	0	8	0	12	150
New York	19	19	5	148	128	229	0	83	4	143	1,603
Rochester	0	------	0	2	7	5	0	1	0	11	74
Syracuse [1]	0	------	0	6	5	5	[1] 0	0	0	7	53
New Jersey:											
Camden	1	------	1	45	0	9	0	1	0	0	36
Newark	3	1	0	4	10	17	0	6	0	17	100
Trenton	0	------	1	18	5	3	0	3	0	0	37
Pennsylvania:											
Philadelphia	5	4	2	274	38	109	0	21	1	35	530
Pittsburgh	2	------	5	477	30	51	0	8	1	18	197
Reading	0	------	0	3	2	7	0	1	0	1	45
Scranton	0	------	--------	52	-------	5	0	-------	0	3	--------
Ohio:											
Cincinnati	4	------	2	1	16	23	0	11	0	5	150
Cleveland	2	27	3	105	18	54	0	11	0	39	227
Columbus	1	1	1	81	9	5	0	2	0	1	85
Toledo	0	------	0	82	7	3	0	5	0	7	78
Indiana:											
Anderson	0	------	0	1	2	15	4	0	0	3	11
Fort Wayne	0	------	0	30	5	7	0	1	0	0	43
Indianapolis	41	------	3	54	23	28	0	5	0	6	121
South Bend	0	------	0	1	4	3	0	0	0	0	21
Terre Haute	5	------	0	9	0	1	0	0	0	0	28
Illinois:											
Alton	1	------	0	1	4	11	0	0	0	0	13
Chicago	8	22	1	1,328	71	240	0	32	1	45	730
Elgin	0	------	0	3	1	24	0	0	0	4	11
Moline	1	------	0	73	4	12	0	1	0	0	16
Springfield	1	------	0	0	7	4	3	0	0	0	22
Michigan:											
Detroit	9	------	2	531	19	178	1	12	0	83	186
Flint	1	------	1	1	3	41	0	1	0	21	27
Grand Rapids	0	------	0	4	4	29	0	0	0	5	38
Wisconsin:											
Kenosha	0	------	0	2	0	0	0	0	0	0	4
Madison	0	------	0	0	0	2	0	0	0	3	19
Milwaukee	0	1	1	728	10	22	0	2	0	15	112
Racine	0	------	0	2	1	6	0	0	0	0	10
Superior	0	------	0	0	0	2	1	1	0	1	12

[1] The report from the city health officer of 1 case of smallpox in Syracuse for the week ended January 1, 1938, Pub. Health Rep., January 21, p. 166, was an error, later information stating that no case had occurred.

City reports for week ended Jan. 22, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	1	0	4	4	1	0	0	6	22
Minneapolis	0	------	2	2	12	21	0	1	0	3	117
St. Paul	0	------	0	5	0	5	26	0	0	2	62
Iowa:											
Cedar Rapids	0	------	------	1	------	6	0	------	0	5	------
Davenport	0	------	------	45	------	3	0	------	0	0	------
Des Moines	0	------	------	1	------	21	2	------	0	1	33
Sioux City	1	------	------	0	------	0	0	------	0	0	------
Waterloo	0	------	------	0	------	5	0	------	0	0	------
Missouri:											
Kansas City	1	------	0	92	22	13	0	0	0	3	123
St. Joseph	0	------	0	1	8	5	0	0	0	0	32
St. Louis	8	------	0	240	13	70	5	7	0	3	249
North Dakota:											
Fargo	0	------	0	0	1	7	0	0	0	0	13
Grand Forks	0	------	------	0	------	3	0	------	0	0	------
Minot	0	------	0	0	0	0	6	0	0	16	4
South Dakota:											
Aberdeen	0	------	------	2	------	0	0	------	0	3	------
Sioux Falls	0	------	0	0	0	0	0	0	0	0	9
Nebraska:											
Lincoln	0	------	------	1	------	6	0	------	0	0	------
Omaha	0	------	0	2	0	4	0	0	0	0	52
Kansas:											
Lawrence	0	------	0	2	1	0	0	0	0	2	9
Topeka	0	------	0	0	2	4	0	0	0	26	22
Wichita	0	------	0	1	2	3	0	1	0	2	33
Delaware:											
Wilmington	0	------	0	2	6	7	0	1	0	6	41
Maryland:											
Baltimore	4	9	4	3	25	28	0	9	2	35	236
Cumberland	0	------	0	0	1	0	0	0	0	0	15
Frederick	0	------	0	0	0	0	0	0	0	0	8
District of Columbia:											
Washington	9	3	2	12	20	15	0	8	3	3	160
Virginia:											
Lynchburg	2	------	0	1	1	0	0	0	1	6	15
Norfolk	0	------	0	101	6	16	0	2	0	2	29
Richmond	0	------	1	3	5	5	0	0	0	0	52
Roanoke	2	------	1	1	0	1	0	1	0	2	21
West Virginia:											
Charleston	0	1	0	35	4	1	0	0	0	2	30
Huntington	0	------	------	33	------	1	0	------	0	0	------
Wheeling	0	------	0	5	4	2	0	1	0	12	24
North Carolina:											
Gastonia	0	------	------	0	------	0	0	------	0	0	------
Raleigh	0	------	0	2	3	0	0	1	0	44	15
Wilmington	0	------	0	3	2	0	0	0	0	5	15
Winston-Salem	0	------	0	2	5	2	0	2	0	24	20
South Carolina:											
Charleston	1	44	3	9	4	3	0	3	0	0	28
Florence	0	------	0	0	0	1	0	1	0	0	10
Greenville	0	------	0	1	7	0	0	1	0	12	14
Georgia:											
Atlanta	1	15	1	175	8	7	0	9	0	12	102
Brunswick	0	------	0	0	0	0	0	0	0	0	2
Savannah	0	------	0	0	4	3	0	3	2	0	42
Florida:											
Miami	0	1	0	112	2	0	0	1	0	0	29
Tampa	1	1	1	1	2	1	0	0	0	0	23
Kentucky:											
Ashland	2	------	------	3	------	2	0	------	0	12	------
Covington	0	------	1	0	3	2	0	1	0	0	23
Lexington	0	------	0	0	3	0	0	1	0	0	18
Louisville	1	4	0	132	5	33	0	2	0	3	50
Tennessee:											
Knoxville	1	5	0	14	0	1	0	1	0	0	24
Memphis	1	2	2	209	5	4	0	7	0	5	88
Nashville	0	------	1	4	3	2	0	2	0	4	55
Alabama:											
Birmingham	2	21	4	38	7	5	0	3	0	0	74
Mobile	0	------	1	0	3	0	0	0	0	0	27
Montgomery	1	------	------	4	------	0	0	------	0	5	------

City reports for week ended Jan. 22, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Arkansas:											
Fort Smith	0	------	--------	0	------	1	6	------	0	2	-------
Little Rock	1	------	2	110	5	1	0	0	0	1	9
Louisiana:											
Lake Charles	0	------	0	0	1	1	0	1	0	1	13
New Orleans	3	8	5	0	20	8	0	15	4	1	187
Shreveport	0	------	0	2	6	4	0	2	0	0	41
Oklahoma:											
Oklahoma City	2	------	0	0	3	6	0	0	0	0	35
Tulsa	2	------	--------	1	------	2	0	------	0	25	-------
Texas:											
Dallas	3	7	4	0	10	11	0	4	0	0	78
Fort Worth	4	------	0	1	8	7	1	0	0	2	40
Galveston	0	------	0	0	2	1	0	1	1	0	19
Houston	5	------	1	1	8	5	0	5	0	0	93
San Antonio	2	------	2	0	11	0	0	12	0	0	72
Montana:											
Billings	0	------	0	0	1	0	0	0	0	0	4
Great Falls	0	------	0	0	3	0	0	0	0	23	8
Helena	0	------	0	0	0	1	0	0	0	0	3
Missoula	0	------	0	0	1	1	0	0	0	0	4
Idaho:											
Boise	0	------	0	0	0	0	8	0	0	8	4
Colorado:											
Colorado Springs	0	------	0	0	0	3	0	0	0	0	12
Denver	7	------	1	216	11	25	0	2	0	3	95
Pueblo	0	------	0	0	2	0	0	0	0	7	13
New Mexico:											
Albuquerque	0	------	0	18	2	2	0	1	0	4	6
Utah:											
Salt Lake City	0	------	1	3	2	20	0	1	0	6	40
Washington:											
Seattle	1	------	1	2	2	1	0	4	0	63	95
Spokane	0	------	0	1	4	4	0	0	0	9	36
Tacoma	0	------	0	0	5	7	1	0	0	22	22
Oregon:											
Portland	0	------	2	0	5	21	0	1	0	0	95
Salem	0	4	--------	1	------	0	0	------	0	0	-------
California:											
Los Angeles	6	25	2	7	30	52	0	17	0	31	371
Sacramento	0	------	0	0	3	4	0	1	0	33	26
San Francisco	0	------	0	1	12	11	0	12	0	66	183

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Maine:			
Portland	1	0	0
New York:			
Buffalo	4	0	0
New York	2	3	1
Pennsylvania:			
Philadelphia	2	1	0
Ohio:			
Cincinnati	0	0	1
Indiana:			
Indianapolis	0	0	1
Illinois:			
Chicago	0	1	0
Minnesota:			
Minneapolis	1	0	0
Missouri:			
St. Louis	2	0	0
Maryland:			
Baltimore	2	0	0

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
District of Columbia:			
Washington	1	1	0
Virginia:			
Lynchburg	1	0	0
Alabama:			
Birmingham	1	0	0
Tennessee:			
Memphis	2	0	0
Kentucky:			
Ashland	1	0	0
Arkansas:			
Little Rock	0	1	0
Louisiana:			
New Orleans	0	1	0
Shreveport	0	1	0
Texas:			
Dallas	1	0	0
California:			
Los Angeles	0	1	0

Encephalitis, epidemic or lethargic.—Cases: Newark, 1; New York, 2; Toledo, 1; Washington, D. C., 1.

Pellagra.—Cases: Winston-Salem, 1; Atlanta, 4; Birmingham, 2; New Orleans, 1; Dallas, 2; San Francisco, 1.

Typhus Fever.—Cases: Miami, 1.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—2 weeks ended January 15, 1938.—During the 2 weeks ended January 15, 1938, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis					1	1				2
Chickenpox		30	24	320	684	134	49	68	192	1, 501
Diphtheria		4	5	100	11	4	1	7	1	133
Dysentery					1					1
Erysipelas				12	4	2	2	5	3	28
Influenza		3			40				37	80
Lethargic encephalitis									1	1
Measles		51	12	209	453	27	76	101	331	1, 260
Mumps		6	1		159	52	10	4	56	288
Paratyphoid fever					1			1		2
Pneumonia		4			79		3		19	105
Poliomyelitis		1	2	4	2		1	3	1	14
Scarlet fever		17	19	257	258	73	109	66	32	831
Smallpox							1	1		2
Trachoma					1			1	1	3
Tuberculosis	2	13	15	92	93	2	3	2	29	251
Typhoid fever		1	5	51	6		1		5	69
Undulant fever					3			3		6
Whooping cough				230	96	30	11	7	95	469

CZECHOSLOVAKIA

Communicable diseases—October 1937.—During the month of October 1937, certain communicable diseases were reported in Czechoslovakia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	3		Paratyphoid fever	21	
Cerebrospinal meningitis	14	3	Poliomyelitis	41	4
Chickenpox	200		Puerperal fever	23	5
Diphtheria	4, 260	196	Scarlet fever	2, 793	26
Dysentery	974	110	Trachoma	79	
Influenza	37		Tularaemia	3	
Lethargic encephalitis	13	1	Typhoid fever	1, 100	70
Malaria	249				

SWEDEN

Notifiable diseases—November 1937.—During the month of November 1937, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	7	Poliomyelitis	[1] 209
Diphtheria	31	Scarlet fever	1,564
Dysentery	27	Syphilis	36
Epidemic encephalitis	1	Typhoid fever	5
Gonorrhea	1,026	Undulant fever	14
Paratyphoid fever	11	Weil's disease	1

---

[1] Includes 20 cases nonparalytic at time of notification.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for January 28, 1938, pages 144–159. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

Indochina (French).—During the week ended January 22, 1938, 7 cases of cholera were reported in Annam Province, and 2 cases of cholera in Tonkin Province, French Indochina.

Plague

Hawaii Territory—Island of Hawaii—Hamakua District—Paauhau Sector.—A rat found on January 17, 1938, and another on January 21, 1938, in Paauhau Sector, Hamakua District, Island of Hawaii, Hawaii Territory, have been proved plague infected.

Peru—Lima Department.—During the month of December 1938, 6 cases of plague with 5 deaths were reported in Lima Department, Peru.

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IN THIS ISSUE

Summary of Current Prevalence of Communicable Diseases
Airplane Dusting in the Control of Anopheles Breeding
The Reliability of Medical Judgments on Malnutrition
Provisional Mortality Statistics for 1936, by Causes

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THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg. Gen. ROBERT OLESEN, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PUBLIC HEALTH REPORTS

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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

January 2-29, 1938

The accompanying table summarizes the prevalence of eight important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the Public Health Reports under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ending January 29, the number reported for the corresponding period in 1937, and the median number for the years 1933-37.

DISEASES ABOVE MEDIAN PREVALENCE

Measles.—The number of cases of measles rose from approximately 33,000 for the preceding 4-week period to more than 71,000 for the 4 weeks ending January 29—an increase of about 38,000 cases. The current incidence is more than four times as high as that for the corresponding period in each of the years 1937 and 1936, in both of which years the incidence was low, and more than 1.3 times that in each of the years 1935 and 1934, in both of which years the incidence was high. The 5-year median for this period is 21,656, and is for 1933, a more normal measles year; the current incidence is more than 3.5 times that figure. In the New England region the incidence was relatively low, and in the West South Central, Mountain, and Pacific regions it followed the seasonal level fairly closely; but in other areas the numbers of cases for the current period were from more than 2 to more than 11 times the median.

Scarlet fever.—The number of cases of scarlet fever reported for the current period was 23,787, approximately the same as the number (23,617) reported for the corresponding period in 1937, which figure also represents the median incidence for the years 1933-37. The North Central regions continued to report a relatively high prevalence, while in the Middle Atlantic region the number of cases was considerably below the expected seasonal level, and in the remaining regions the incidence was close to normal.

Number of reported cases of 8 communicable diseases in the United States during the 4-week period Jan. 2–29, 1938, the number for the corresponding period in 1937, and the median number of cases for the corresponding period 1933–37 [1]

Geographic division	Current period	1937	5-year median	Current period	1937	5-year median	Current period	1937	5-year median	Current period	1937	5-year median
	Diphtheria			Influenza [2]			Measles [3]			Meningococcus meningitis		
United States [1]	2,761	2,489	3,385	11,628	108,110	34,610	71,296	16,688	21,656	377	542	362
New England	50	44	100	77	3,941	656	2,287	5,999	3,612	11	17	9
Middle Atlantic	368	455	567	122	4,331	1,018	24,928	3,432	7,412	62	97	50
East North Central	630	441	616	354	10,010	3,080	23,201	600	3,281	45	101	101
West North Central	247	138	376	686	28,178	2,253	6,142	212	2,477	28	31	33
South Atlantic	487	609	539	3,146	7,313	7,313	7,875	2,776	3,066	77	147	54
East South Central	221	205	300	2,284	4,488	4,488	3,695	324	324	96	66	39
West South Central	478	377	562	3,908	11,091	2,900	989	1,428	998	25	32	30
Mountain	123	66	86	407	15,048	2,602	1,579	1,390	1,390	17	30	19
Pacific	157	154	196	644	23,710	1,411	600	527	1,079	16	21	21
	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
United States [1]	85	100	98	23,787	23,617	23,617	2,435	1,144	751	464	487	629
New England	1	1	6	1,816	1,661	1,661	0	0	0	17	36	14
Middle Atlantic	8	6	12	4,828	6,088	5,966	0	46	0	54	72	74
East North Central	16	20	10	8,170	7,710	7,710	508	194	154	31	63	63
West North Central	6	10	8	3,827	3,676	2,030	916	621	180	71	17	47
South Atlantic	8	16	9	1,150	1,183	1,245	13	3	11	87	89	103
East South Central	13	22	11	612	620	620	224	6	7	30	55	55
West South Central	16	6	5	996	351	711	143	26	44	115	101	101
Mountain	3	3	3	990	750	750	255	128	58	24	22	22
Pacific	14	16	16	1,398	1,578	1,551	376	120	120	35	32	37

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[1] 48 States. Nevada is excluded and the District of Columbia is counted as a State in these reports.
[2] 44 States and New York City.
[3] 46 States. Mississippi and Georgia are not included.

Smallpox.—A total of 2,435 cases of smallpox was reported for the 4 weeks ending January 29, as compared with 1,144, 765, and 751 for the corresponding period in 1937, 1936, and 1935, respectively. The current incidence is the highest since 1932, when 2,084 cases were reported for this period. Minnesota reported 302 cases, Illinois 246, Iowa 239, Missouri 206, Indiana 190, Kentucky, 165, California 160, Idaho 142, and Washington (State) 140—a total of 1,790 cases as compared with 610 for these States for the corresponding period in 1937. The remaining cases were distributed among the other States, the number (645) being about 20 percent in excess of that for the same States last year. The New England and Middle Atlantic regions remained free from the disease, and the South Atlantic region reported 13 cases, a larger number than last year, but only slightly above the 1933–37 median level.

Meningococcus meningitis.—For the current period 377 cases of meningococcus meningitis were reported—about 70 percent of the figure for the corresponding period in 1937 and about 60 percent of that for 1936. In 1935, 1934, and 1933 the numbers of cases for this period totaled 307, 210, and 362, respectively. While the current incidence is only slightly above that of the 1933–37 median, it represents the highest incidence for this period since 1931. The disease is most prevalent in the Middle and South Atlantic and East South Central regions, each of which reported a very considerable increase over the normal seasonal expectancy. The same regions reported a high incidence at this time in 1937. In the East North Central region the incidence was the lowest in recent years, and other areas reported about the normal seasonal incidence.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—The downward trend of diphtheria was interrupted by a 10-percent increase during the current period over the corresponding period in 1937. The Middle Atlantic and South Atlantic regions reported decreases from last year's figures for this period, and in the Pacific region the incidence was practically the same as last year, but in all other regions it was considerably higher, the increases ranging from 10 percent in the East South Central regions to about 85 percent in the Mountain. While the disease was more prevalent than last year in some regions, the number of cases (2,761) for the country as a whole was only about 80 percent of the 1933–37 median number for this period.

Poliomyelitis.—The number of cases of poliomyelitis reported for the 4 weeks ending January 29 was 85, as compared with 100, 79, and 115 for the corresponding period in the years 1937, 1936, and 1935, respectively. The West South Central division reported 16 cases, as compared with 6 last year and with a median of 5, but in all other regions the incidence was about normal for the season. For the entire country the number of cases was slightly lower than the average seasonal level.

Typhoid and paratyphoid fever.—The number of typhoid fever cases was slightly below that for the corresponding period in 1937, and more than 20 percent below the 1933–37 median for this period. Due principally to a rather high incidence in Missouri (51 cases) and Texas (67 cases), the incidence in the West North Central and West South Central regions was somewhat above the seasonal expectancy. In the Middle Atlantic, East North Central, and East South Central areas it was the lowest in recent years, and in the New England, Mountain, and Pacific regions it was about normal.

Influenza.—Reports indicated only the normal seasonal increase of influenza during the 4 weeks ending January 29, with 11,628 cases reported, approximately 4,100 more than for the preceding 4 weeks. In relation to preceding years this number was only about 10 percent of that reported for the corresponding period in 1937, but was about 10 percent above that in 1936. A small outbreak of influenza that was comparable in size to the epidemic of the winter of 1932–33, occurred in January last year, and in 1935, the year that occupies the median position in the years 1933 to 1937, there was a minor outbreak in the eastern part of the country at this time. The highest incidence for the current period was reported from the South Atlantic and South Central regions, but of those areas only the West South Central showed any excess over the normal seasonal incidence.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ending January 29, based on data received from the Bureau of the Census, was 12.6 per 1,000 inhabitants (annual basis). For the corresponding period in 1937, 1936, and 1935 the rates were 15.2, 13.4, and 13.3, respectively. The presence of a minor influenza epidemic with a relatively high death rate from influenza and pneumonia was mostly responsible for the high rate of 1937. The average rate for the years 1932–36 is 12.9.

THE ROLE OF AIRPLANE DUSTING IN THE CONTROL OF ANOPHELES BREEDING ASSOCIATED WITH IMPOUNDED WATERS

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Airplane dusting of paris green on impounded waters must be perfected to control production therefrom of the malaria mosquito of the Southeastern States (*Anopheles quadrimaculatus*). Until biological control methods are improved, no other known method is economically possible where there are large expanses of shallow "sheet-water" overgrown with aquatic vegetation. Such expanses are now measured in thousands of acres as impoundages have become larger. Flood-control projects and river basin improvements planned for the immediate future indicate a great increase in the number of large impoundages. Experience with airplane dusting reveals problems presented by impounded waters which have not arisen elsewhere. As the solution of these problems involves much labor and expense, research opportunities have been infrequent. Today it becomes imperative to solve them.

The Tennessee Valley Authority fortunately has set up a research unit within its malaria control section for study of malaria control methods on impounded waters. This unit cooperates with the Public Health Service and all other organizations interested in the control of malaria, and offers an unsurpassed field for study of the malaria mosquito and methods for controlling its production. The paper presented here is a preliminary report of one such study which forecasts solution of the major problems connected with airplane dusting on impounded waters.—L. L. WILLIAMS, JR., *Senior Surgeon, U. S. Public Health Service.*

Introduction

Impounding the Tennessee River is the basic feature of the plan for development of the Tennessee River Valley by the Tennessee Valley Authority. When the program of dam construction has been completed, the river will have been converted from a flowing stream into a chain of lakes. At the present time two lakes have been impounded; another will be created in April 1938, and two more in 1939, exclusive of lakes on tributary streams.

Endemic malaria already exists rather generally throughout the Tennessee Valley in western Tennessee and northern Alabama, and small endemic foci are known to be present in the lower portion of the Valley in eastern Tennessee. This malaria is due to transmission by mosquitoes breeding in collections of water in the flood plains of the Tennessee River and its tributaries, in lime sink ponds, and in other natural breeding places. While the impounding of the river will destroy many of these breeding places, the resulting lakes will create, potentially at least, a much larger breeding surface for *Anopheles quadrimaculatus*, the only proved natural vector of malaria in this region. Therefore, the situation existing now and that which will ultimately present itself are of especial significance to persons interested in malaria and its control; and an opportunity for the study of malaria associated with impounded water and a responsibility for the control of such malaria has been created which is without parallel in this country. These facts are recognized by the Authority and a Division of Malaria Studies and Control, a functional unit of the Health and Safety Department, has been organized to carry out a comprehensive research and control program.

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It is the hope and belief of the personnel of this Division that we shall eventually be able to effect a biological control of mosquito breeding in impounded waters; but until such a program has been developed, we are obligated to utilize all other means at our disposal to effect mosquito control. Accordingly, we have made extensive use of larvicides while fully realizing the limitations and cost of such a program. During the past 3 years a part of our research program has been directed toward the development of cheaper larvicidal materials and methods for their application.

This report deals with our experience with airplane dusting. At the end of the 1935 season we concluded that airplane dusting was not a practical method for applying larvicidal dusts to breeding areas of limited extent along a tortuous shore line but that it offered definite promise as a means of treating large expanses of water surface. Our further experience during the past 2 years has strengthened these latter convictions and has resulted in a considerable improvement of equipment and a more efficient dusting technique, with a commensurate reduction of operation cost.

The first part of this report is a general discussion of our experience with acreage dusting. The second part is concerned with certain experiments carried out during 1937 which were designed to determine the efficiency of our routine operations. These latter experiments were performed with the assistance of Mr. H. A. Johnson, of the United States Public Health Service, and we wish to express our gratitude to Senior Surgeon L. L. Williams, Jr., for making the services of Mr. Johnson available to us. We also wish to express our appreciation for the advice and help given by Mr. B. R. Coad, of the Delta Air Corporation, who has acted as a consultant during the summer of 1937 and whose long experience with the application of insecticidal dusts by means of airplanes has been of tremendous value in the development of this work.

Part I.—General Discussion

The sudden conversion of a flowing stream into a very large lake is inevitably attended by major physical and biological changes which begin as soon as the pool level rises above the original channel of the stream and continue for a period of several years. These changes form such an interesting sequence of events and are so often associated with profuse *Anopheles* breeding that their essential features merit description here.

The primary physical change consists in the flooding of all land lying below the elevation of the spillways at the dam. Small tributary streams become large expanses of quiet water and the impounded stream, now extending far beyond its flood plains, becomes a broad lake. The shore line of the new lake is straight or tortuous, precipitous or flat, depending upon the topography of the region. The original shore line at maximum pool level is only temporary, for erosion by wave action begins to take place at once. Inundated terrestrial vegetation is killed, but its vestiges appear for a long time in the form of floating debris, and, with other types of flotage, it produces food and protection for mosquito larvae. In the course of time the terrestrial marginal growth becomes replaced by aquatic or semiaquatic vegetation, and herbaceous plants may establish themselves if the pool level is lowered during the season of their growth. Such profound physical changes rarely, if ever, occur in natural breeding places.

When a lake is impounded in a region of little relief, a wide variety of breeding places of *A. quadrimaculatus* may be created. The lower part of such a reservoir usually has a relatively precipitous shore line; the middle portion is characterized by broad expanses of shallow water; and the upper portion is within the old channel of the river. *Anopheles* breeding is so constantly associated with vegetation, alone or with flotage, that in the final analysis control of such breeding becomes the control of the conditions that make it possible. Thus it can be seen that the problem of the control of *Anopheles* breeding associated with impounded water is in many respects fundamentally different from that of natural waters.

We have been watching the events described above take place in Lake Wheeler since its impounding in April 1937. This lake is in northern Alabama, is 74.1 miles in length, has a shoreline of 1,063 miles and a surface area of 67,100 acres. Following the clearing of the reservoir a considerable growth of sprouts from stumpage occurred which we were unable to remove prior to the impounding of the lake. As a consequence, at maximum pool level the tops of this dense vegetation penetrated the lake surface in many areas, particularly in the middle portion of the reservoir. Since the lake was created in the spring, flotage which did not have an opportunity to become waterlogged and sink was held in large amounts throughout the entire summer by this emergent vegetation and also by dead emergent annual plants in the very shallow areas. With almost ideal breeding conditions thus created, involving some 10,000 acres of water, very heavy production of *A. quadrimaculatus* began in June.

Control of breeding by larvicidal operations was complicated by the fact that most of this surface occurred in water too shallow to allow the operation of larvicidal boat units. We had anticipated this situation and had concluded that the only practical means for the application of larvicides to such areas was by airplane. Accordingly we were ready to establish airplane dusting operations at the beginning of the 1937 season.

Two airplanes were put into service early in June and were used throughout the season. One of these airplanes is the property of the Tennessee Valley Authority and had been used for airplane dusting during the seasons of 1935 and 1936; the other is owned by the Delta Air Corporation of Monroe, La., and was operated by this organization under a service contract with the Authority.

The airplane owned by the Authority is a Stearman, model 4–D, open biplane powered with a 300-horsepower motor. During the winter of 1936–37 its dusting equipment was completely redesigned. The new equipment consisted of a plywood hopper of approximately 21 cubic feet capacity, which was installed in front of the pilot's cockpit so as to place the dust load as near the center of gravity as possible. The top of this hopper is curved to conform to the shape of the fuselage and is covered with airplane fabric to prevent buckling of the plywood. The interior of the hopper was treated with several coats of pigmented airplane fabric "dope" for protection. The hopper is loaded through a hatch at the top. The dust is discharged through a short metal throat extending from the bottom of the hopper through the fuselage covering to the discharging funnel or venturi. This throat extends the entire width of the fuselage. The discharging funnel is made of 16-gage aluminum and has a maximum depth of 5 inches, but the depth may be adjusted by raising or lowering the lower section. Agitation of the dust in the hopper is provided by two barrel-type agitators which are driven by a four-bladed wooden impeller located on the lower left wing near the fuselage. The action of this impeller is transmitted through a 50 to 1 reduction gear, the drive shaft of which turns the upper agitator which in turn operates the lower agitator by a chain and sprocket arrangement. The release valve is of the sliding type and consists of a ¼-inch aluminum plate traveling in brass guides. It is operated from the pilot's cockpit by means of a lever and is calibrated and can be set for six different settings.

The airplane operated by the Delta Air Corporation is a Huff-Daland open biplane especially designed for crop dusting. Its dusting equipment is not unlike that described above, except that the hopper is somewhat smaller, having a capacity of approximately 16 cubic feet. This airplane has thick, high-lift aerfoil sections of full cantilever construction but connected at the tip by wing struts. It is powered by a 200-horsepower motor.

The construction features of the dusting equipment installed in our airplane were developed as a result of our 3 years' experience with other apparatus and in part were modeled after equipment in crop-dusting airplanes. The dust cloud liberated can be positively controlled with this equipment and there is little or no leakage of dust into the fuselage, a condition which formerly gave us considerable concern.

The disadvantage of the use of an airplane of the type owned by the Authority is that it must be flown at a high speed in order to maintain its altitude and to clear obstructions. There is always a tendency for planes of this type to "mush" in a sudden climb, that is, to continue in the direction of the line of flight while gaining altitude. The thick wing sections of the airplane operated by the Delta Air Corporation and its other construction features permit a more positive control of the airplane. This airplane flies "tail-high," and its pilot sits higher in the cockpit, allowing greater vertical visibility than is possible in planes of the type owned by the Authority.

There was little difference between the dust clouds liberated by the two airplanes. The greater speed of the Authority's airplane and its greater load-carrying capacity made its use more economical for dusting areas at a considerable distance from the nearest landing field and for dusting broad expanses of breeding surface. The contract plane, especially efficient for dusting "close" situations, was principally used for this type of operation and for dusting areas near one of our loading fields.

Before actual dusting operations were begun, the rate of flow of soapstone dust was carefully calibrated for the various valve openings. We assumed that the volumetric rate of discharge of soapstone dust would approximate that of the paris green-soapstone mixtures to be used, and subsequent tests showed that this assumption was correct within the limits of the accuracy of timing and valve setting. The distribution of paris green was determined for various altitudes and rates of flow by counting paris green particles collected on slides which had been placed along the flight path of the airplane. As a result of these experiments we estimated that a 200-foot path was effectively covered by dust liberated at an altitude of approximately 25 feet, and to a large extent we based our routine operations on these data. As a matter of fact, it was our practice to lap the estimated 200-foot dust paths to assure adequate coverage.

The larvicidal dust used in this work was composed of paris green and powdered soapstone in varying proportions. The first dust used contained 10 percent paris green by volume and was distributed at the rate of about 0.5 pound per acre, assuming a lethal dust path 200 feet wide. This operation was not uniformly effective as judged by collections of larvae before and after dusting, and rising adult densities in collecting stations, observations which were routinely made as a check on the efficiency of our operations. The concentration of paris green in the dust was raised until it represented 20 percent of total dust volume, and the use of this dust produced satisfactory results. As judged by larvae collections, practically 100 percent lethal effect was obtained in areas not protected by dense vegetation. On three occasions dead larvae were found in mats of algae 30 minutes after a dusting operation, and dissection of these larvae revealed paris green in their guts.

Airplane dusting was carried out in the early morning, and it has been our practice to begin dusting as soon as there is light enough to see the dust cloud. At this time there is less wind than at any other time, and the air is not "bumpy," as becomes the case later in the morning. As a rule, our dusting schedule for one day was complete by 6 a. m. There is one possible disadvantage to dusting in the early morning; namely, that the vegetation is covered with dew and may therefore intercept and hold dust that would not be intercepted by dry vegetation. In our experience it is not often practicable to dust later in the day, except occasionally in the late afternoon.

Our airplane dusting in 1937 was done at an average altitude of approximately 20 feet. Dusting was rarely done at an altitude of over 30 feet. Flying at this altitude permitted more accurate placing of the dust cloud because it was less influenced by drift, which was always present to some extent. We also believed that low flying over densely overgrown breeding places was especially desirable, since the propeller blast tends to blow the dust through the vegetation.

During the season May 15 through September, the two airplanes flew a total of 264 hours and 33 minutes and applied 316,000 pounds of mixed dust containing approximately 25 percent, or 79,000 pounds, of paris green. It is estimated that a total of 83,700 acres of breeding area were treated, with slightly less than an average of 1 pound of paris green per acre.

Cost figures on the contract airplane are more representative than on the Tennessee Valley Authority airplane, owing to some unusual cost charges and the necessity of basing this airplane at a distance of 50 miles from the center of dusting operations.

The contract plane flew a total of 194 hours and 38 minutes at a cost of $42.90 per hour and dusted approximately 72,650 acres at a cost of $0.367 per acre treated. This does not include inspection work and supervision.

Part II.—Experiments Conducted in 1937

As previously stated, we were unable in certain situations to secure efficient results with paris green dust applied by airplane. Larvae collections were made more or less at random over an area which had been dusted on the same day and the collections were usually begun approximately 3 hours after the completion of dusting. We were anxious to examine our airplane dusting operations in a more critical manner and had hoped to be able to carry out a series of experiments to this end in a portion of Lake Wheeler which was being routinely treated at weekly intervals. This we were unable to do because the pool level in Lake Wheeler was constantly shifting throughout the summer. We eventually established an experimental area with a constant pool level in a portion of the Wheeler Reservoir.

The area selected for experimental work was a small, natural spring-fed swamp, a part of the Wheeler Reservoir which had been cleared in 1935. This area lies one-half mile south of Harris Station on the Louisville & Nashville Railroad and immediately east of the railroad embankment. The entire tract is about 50 acres in extent, but only the western half, an area approximately 1,400 feet square, was used in the experiment. This area was staked off into flight paths by placing poles 200 feet apart in a north and south direction and approximately 250 feet apart in an east and west direction. This area permitted flights of the airplane along the stake rows in an east and west direction with definite spacings of 200 feet.

During the month of August the pool level of Lake Wheeler was much lower than we anticipated and the area under consideration contained very little water. This condition was rectified by placing a small dam across the outlet of the swamp so that the streams from several springs could inundate the swamp.

Referring to figure 1, it will be noted that the first north to south line of 200-foot interval stakes is numbered 1A to 5A, inclusive; the second row, 1B to 5B, inclusive, and so on across the area. To the north of this main staked area a supplemental area 600 feet in length was outlined in a similar manner, the numbering being 10A-11A-1A, 10B-11B-1B, etc. Vegetation present in the experimental area during the period under consideration consisted of a high, dense, bushy second growth of sprouts of tupelo gum, button ball bush, sycamore, black willow, and similar shrubs in the area between lines 4 and 5. It was very thick and grew to a height of 8 feet or more, with the branches interlaced horizontally, thus presenting vertical barriers to a dust cloud liberated from above (fig. 2). This area also contained a more or less dense undergrowth of plants. Low grasses, sedges, smartweed, and water lilies predominated in the area generally delineated by stakes 1A-2B-2C-3C-3B-3A-2A (fig. 3). This low vegetation grew to heights of 12 to 16 inches and was more or less open vertically. The remainder of the area contained relatively open mixtures of the vegetation types described (fig. 4). The entire area further contained many hundreds of tree stumps of all sizes. Very

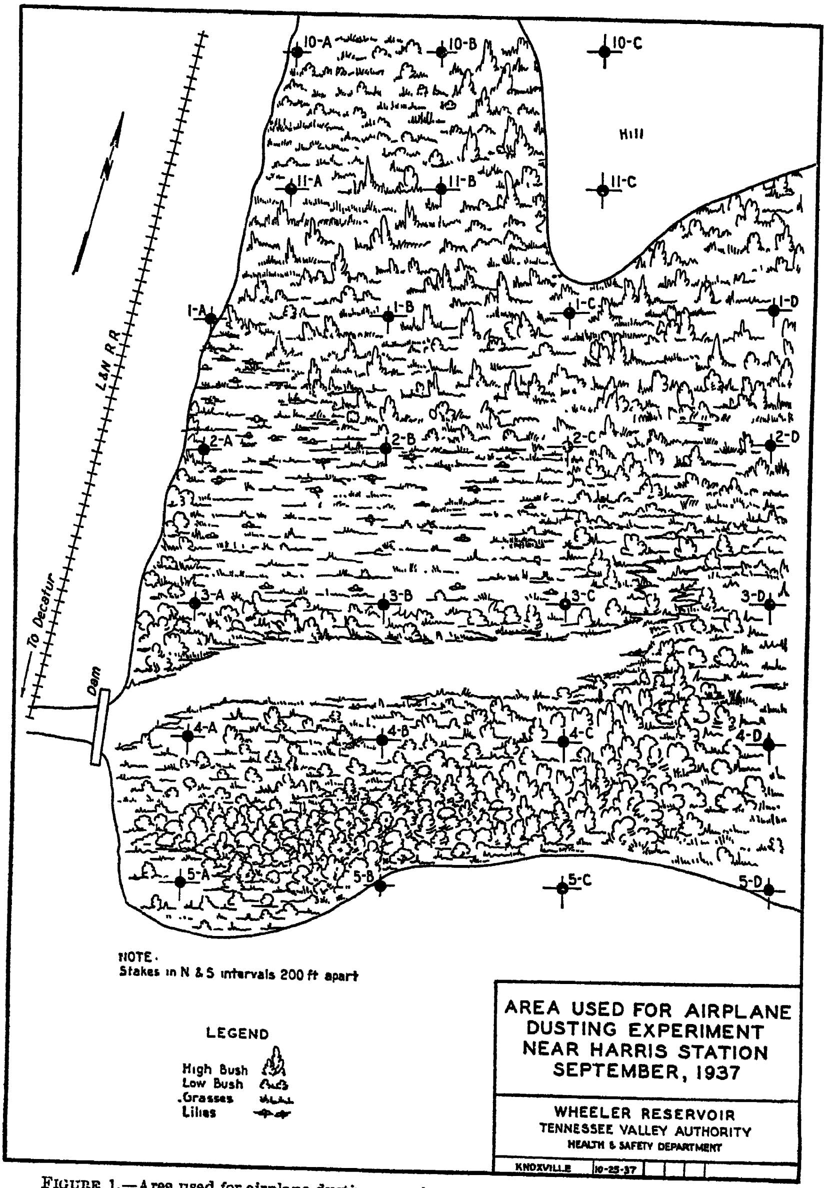

FIGURE 1.—Area used for airplane dusting experiment near Harris Station, September 1937.

little algae was encountered during the period of the experiments. The experimental area as a whole conforms very closely to the type situation with which we had to contend throughout the summer.

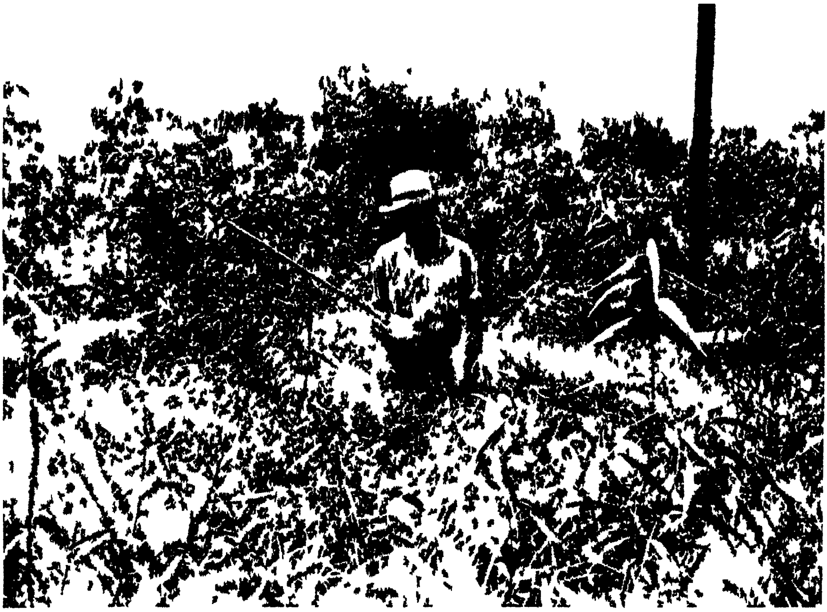

FIGURE 2—Dense second growth vegetation and undergrowth of annual plants Harris Station experimental pool Wheeler Reservoir

FIGURE 3—Grasses sedges smartweed and waterlilies Harris Station experimental pool Wheeler Reservoir

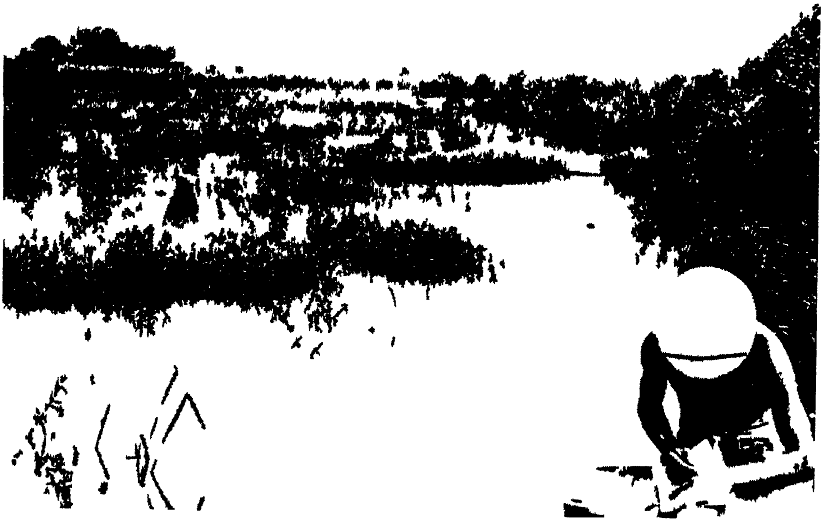

FIGURE 4 —Varieties of vegetation Harris Station experimental pool Wheeler Reservoir

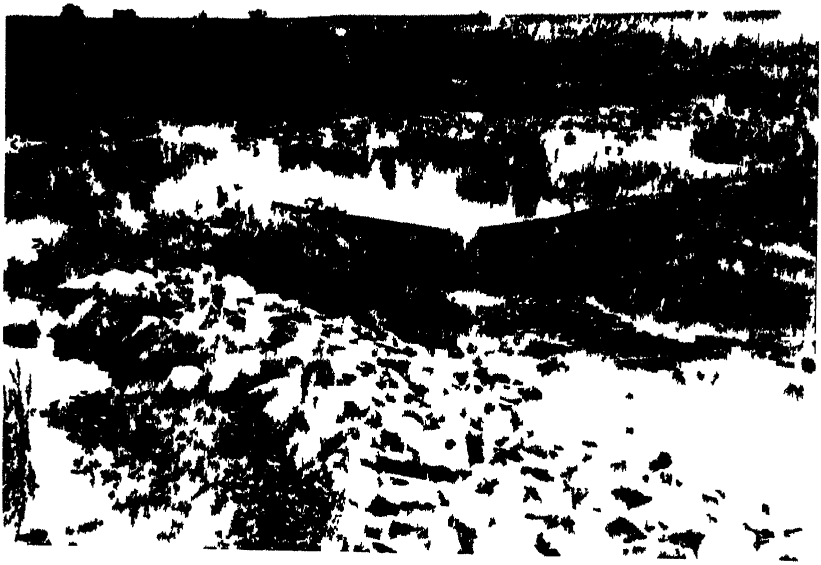

FIGURE 5 —Small earth filled dam constructed to produce Harris Station experimental pool Wheel
Reservoir

FIGURE 6—Huff Daland dusting plane treating Harris Station experimental pool Wheeler Reservoir Altitude 10 feet

FIGURE 7—Huff Daland dusting plane treating Flint Creek area Altitude 50 feet

FIGURE 8.—Stearman dusting plane treating a swamp near Muscle Shoals airport. Note dust cloud in left background which was laid down just previous to cloud in process of liberation.

During the month of June moderately heavy *Anopheles* breeding was encountered throughout the experimental area; but as the pool level was lowered, this breeding decreased. The small dam was placed across the outlet of the swamp on August 15, and a constant level pool was obtained about August 20 (fig. 5). *Anopheles* breeding slowly returned, and by August 25 approximately two larvae per dip could be obtained in the experimental area. Extensive observations of the area demonstrated a rather uniform amount of *Anopheles* breeding throughout the entire area, with slightly higher density of larvae in the densely overgrown portion.

EXPERIMENT I

The first experiment was performed on the morning of August 27. The day was warm and clear, with a breeze of approximately 2 miles per hour blowing toward the north. At 6:30 a. m., two flights were made, one along 4A–4B–4C, and the other along 2A–2B–2C. A dust composed of 28.4 percent paris green by weight in powdered soapstone was released at a height of 20 to 25 feet during these flights. The dust cloud drifted slightly toward the north.

In the flight along line 4, the hopper valve was opened 2 inches, representing one-half the total possible opening. This liberated approximately 125 pounds of mixed dust per minute, or 1 pound of paris green per acre, assuming an effective dust path of 200 feet and a dusting rate of 33 acres per minute. In the flight along line 2 the valve was opened 1.5 inches, or three-eighths of the total possible opening, liberating approximately 57 pounds of dust per minute, or 0.5 pound of paris green per acre.

On the previous day dippings were made to determine the presence of larvae along the lines A, B, and C. Four dippings were made at 10-foot intervals across each line and the results recorded. Three hours after dusting, similar dippings were made and recorded. The following comparisons were observed from these records:

Line A.—This line was characterized by a low type vegetation except for the interval 4A to 5A, which was densely brush covered. A 100 percent mortality of *Anopheles* larvae was found in the interval 1A to 4A. The mortality in 4A to 5A was 53 percent.

Line B.—Approximately one-half of this line contained low type vegetation, and in this area a mortality of 94.4 percent was found. The rest of this line contained dense vegetation and showed a mortality of 72.8 percent.

Line C.—This line contained second growth bushes but the growth was not very dense. The mortality here was only 7 percent, but this is probably due to the fact that the dust liberation was stopped at the C line of stakes and this line received only a partial dusting.

One hundred glass slides were placed in hidden positions along the B line before the dusting flight was made. A paris green particle count of these slides showed only one-half as many particles of paris green per square inch from slides placed in the densely overgrown area as was observed from slides placed in the low, open vegetation. On many slides from the area 4B to 5B no paris green particles could be found.

It appears from this experiment that—

1. *Anopheles* larvae destruction was almost complete over a 600-foot swath containing grasses, sedges, and lilies, when 28 percent paris green dust was applied by an airplane at an altitude of 20 feet.

2. The application of larvicides in the densely overgrown area was from 53 to 72 8 percent effective.

3. In the area in which most effective results were obtained, the effective swath width was at least 300 feet. This corresponds to an average coverage of less than 0.5 pound of paris green per acre.

EXPERIMENT II

The second experiment was performed on September 9. The day was cloudy and the humidity was high, since rain had been falling intermittently for about a week. A breeze of approximately 10 miles per hour was blowing toward the north. The water temperature ranged from 69° to 72° F.

At 8 a. m. a flight was made along line 4, liberating a dust containing 28.4 percent paris green, by weight, in powdered soapstone. The valve was open 2 inches, discharging approximately 1 pound paris green per acre. Another flight was made along line 1, liberating a dust containing 28.4 percent paris green, by weight, in Alberoyd.[3] The rate of dust liberation was approximately 1.2 pounds paris green per acre.

These flights were made at an altitude of 6 to 10 feet, and a dense cloud was literally driven to the water surface under the plane in both instances. Due to a brisk cross wind there was an immediate drift of the dust cloud toward the north, practically no dust being visible south of the plane.

Dippings were made for *Anopheles* larvae at 10-foot intervals along lines B and C previous to, and 3½ hours after, dusting. Larvae collections indicated a mortality averaging 50 percent or less over the entire area covered by the dust. It is of interest to note that there was no 100 percent lethal path, even directly under the plane.

On September 10, *Anopheles* larvae were plentiful between rows 4 and 5. Wind and weather conditions were similar to those of the day before. A flight was made along row 5 at an altitude of 6 to 10 feet, liberating a dust containing 18.4 percent paris green, by weight, in Alberoyd, or approximately 1.1 pounds paris green per acre.

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[3] A soapstone dust weighing 70 percent more per cubic foot than the soapstone dust we routinely employ as a diluent

Larvae collections across rows B and C indicated an average mortality of 60 percent. Again there was no path of total destruction. It is interesting to note that *Anopheles* larvae of all sizes were recovered between rows 4 and 5, where a very heavy dust cloud was seen to penetrate into the bushes.

The results of this experiment indicate that there is no apparent difference in the power of paris green to kill *Anopheles* larvae that is due to a difference in the inert diluent used in the dust. As will be shown subsequently, in a later test almost complete destruction of *Anopheles* larvae was obtained where the present test failed. Since the water temperatures were practically the same then as on this date, we may assume that conditions other than water temperature were probably involved. In the second experiment, as in the first, slides were placed along row B. Dust counts made on these slides showed large numbers of paris green particles per square inch wherever the dust cloud was visible. This fact may indicate that some factor connected with extremely low flying or the brisk cross wind might have been responsible for the low mortality recorded.

EXPERIMENT III

A third experiment was performed on September 16. The day was clear and cool, and a dead calm prevailed. Water temperatures ranged from 68° to 70° F. At 6:15 a. m. a flight was made along each of the stake lines, 1, 2, 3, 4, and 5, at an altitude of approximately 75 feet. This test flight closely approximated a routine dusting operation except for the altitude. The dust used was composed of 28.4 percent paris green, by weight, in soapstone, and was liberated at a rate of 0.8 pound per acre of paris green.

The dust cloud appeared to become somewhat attenuated before reaching the water surface. The line 2A to 2D seemed to receive no dust, and at the time of the flight it was believed that this particular line had been untouched by the dust cloud. No distinct drift of dust cloud was observed.

Four hours after dusting, the usual dippings were made across the B and C lines. In the interval 1C to 3C an almost total destruction of *Anopheles* larvae was noted, whereas between 3C and 5C numerous larvae were present. Along the B line 99 percent destruction was found except in the interval 4B to 5B, where larvae of all stages were encountered. The line 2A to 2D, which, it will be recalled, apparently received no dust, exhibited a 100 percent reduction in *Anopheles* larvae.

The entire afternoon was spent in dipping at random over the area, and the findings indicated conclusively that this dusting operation was practically 100 percent effective except in the densely overgrown area between stake rows 4 and 5.

Comment

As a result of our experiences to date we believe that airplane dusting for *Anopheles* control is a practical and relatively economical larvicidal operation. We have secured uniformly excellent control of *Anopheles* breeding with this operation in situations characterized by rather open water which contains low, emergent vegetation, where any other larvicidal operation would have been impractical. We have never secured, with airplane dusting, effectual control of breeding in situations where the water surface is protected by dense, horizontally interlocking vegetation. The experimental dusting of such a situation was approximately 70 percent effective.

The cost of operating a dusting airplane varies considerably, but may be set at about $40 per hour. This is no inconsiderable sum, but considering that 33 acres per minute can be treated for $0.367 per acre by an airplane flying at 82 miles per hour, the rationale of airplane dusting becomes evident. The economy of the operation is dependent upon several factors, such as the distance the dust must be transported by airplane before dusting is begun; the number of flying hours during a season's work; and the size and nature of the acreage to be treated at routine intervals. The control problem must be large enough to justify airplane dusting.

In order to reduce nondusting flying time to a minimum we constructed four landing strips in the Lake Wheeler reservoir area at points convenient to the zone of operations, and the airplanes were loaded at these places. Reduction of the nondusting flying time increased the efficiency of the operation by allowing full advantage to be taken of the short, early morning period of the day when dusting was done.

One experimental flight at 75 feet produced excellent results and seems to indicate the feasibility of dusting at higher altitudes than has been our practice heretofore. Theoretically, the release of more concentrated paris green dusts at high altitudes should lower the cost of airplane dusting operations. We now believe that under optimum conditions our effective swath delivered at an altitude of 25 feet may be 300 feet in width, and that uniform distribution of concentrations of paris green of less than 1 pound per acre will produce excellent results. The width of the dust swath increases with the altitude at which the dust is liberated, within limits, and higher flying should, therefore, reduce the total flying hours. Increasing the pay load will also reduce nondusting flying.

It must be remembered, however, that perfect dusting conditions prevailed at the time of the experimental flight previously mentioned. This does not often occur. Even when there is no wind, the dust cloud tends to drift to some extent, and in our experience it is difficult to place the dust cloud accurately at altitudes higher than 30 feet. Accurate placement of the dust cloud is very necessary to prevent unnecessary waste of dust and to secure effective results.

The results obtained during the 1937 season from the experimental and routine airplane dusting indicate that certain phases of airplane dusting require further study. These studies should include the effect of liberating various dust mixtures at different heights for the purpose of determining the best concentration of paris green and the most effective altitude; the effect of drift with special reference to whether the paris green particles are evenly distributed with the diluent or reach the water surface at different places from the diluent dust particles; the possible influence various diluents may exert on the static electric charge developed on paris green particles as they descend in a dust cloud; and observations on paris green dust after it reaches the water surface, with special reference to its availability for larval ingestion.

In conclusion, we wish to emphasize our belief that airplane dusting for *Anopheles* control on impounded waters is a practical, effective, and economical operation under the conditions described. Like any other technical procedure its efficiency depends upon the utilization of the best procurable personnel and equipment, and careful, painstaking supervision of every detail of the operation.

RELIABILITY OF MEDICAL JUDGMENTS ON MALNUTRITION[1]

By MAYHEW DERRYBERRY, *Senior Public Health Statistician, United States Public Health Service*

The nutritional status of the population, and especially of children, is a public health problem that is receiving more and more attention. During the recent economic depression many surveys were made to determine the prevalence of malnutrition among groups in different localities, and often special programs for the improvement of the nutritional status of the population were instituted. Of late, studies have been undertaken to determine more specifically the extent of malnutrition under various social and environmental conditions. In many of the studies the results of the physical examinations routinely made in schools furnish the data on malnutrition, though in some instances the nutritional status of the groups studied has been specially determined by physicians employed for that purpose.

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[1] From the Division of Public Health Methods, National Institute of Health.

The data for this paper were collected during a study of school health programs by the Research Division of the American Child Health Association. The findings were first presented in terms of correlations in a monograph by Raymond Franzen entitled "Physical Measures of Growth and Nutrition," American Child Health Association, New York, 1929. They are repeated here in somewhat different form, in order to emphasize the practical significance of the material which, to date, seems to have been overlooked by many workers dealing with the problem of malnutrition among children. The author was a member of the research staff at the time of the original study, and the material presented in this paper was developed during his employ in the Association.

Regardless of the source of the data, the estimates of nutritional status have usually been based solely on clinical observations of the children as they appear at the time of the examination. In practically none of the studies has there been provision for the taking of a medical history, or the inclusion of a number of body measurements as an aid to the physician in arriving at a final estimate. This, of course, limits the value of the nutritional estimates that are made, but more extensive and thorough examinations have been considered impracticable because of the expense and time entailed.

Despite the limitations of nutritional estimates made during routine physical examinations, they form the bases for the conclusions reached in many well-known studies on the prevalence of malnutrition. The relative proportions of children who are in poor nutritional status in various localities have been reported from an analysis of such estimates. Likewise changes in the amount of undernourishment among children from one period to another have been determined from a summary of nutritional estimates for successive years. During the depression the annual changes in the proportion of children judged to be malnourished were used to show the effect of lowered economic conditions on the nutritional condition of children. Also the relative effectiveness of different administrative procedures in improving the nutritional status of children has been judged by comparing the nutritional estimates of groups subjected to varied regimes.

In addition to their use in studies these estimates have been, and still are, used in the school health service program for the selection of children to be given special consideration because of their alleged nutritional deficiency. This particular attention may include the giving of a supplementary midmorning lunch, follow-up work in the home, or the assignment to a nutrition class.

In view of the many vital decisions (both with reference to the general prevalence of malnutrition and with reference to specific children) that rest on the physician's estimates of nutritional condition, it seems advisable at this time to reemphasize the limitations of such nutritional estimates and the possibilities for error when records from routine examinations are the bases for either research conclusions or administrative action.

THE EXPERIMENTAL DATA

Three outstanding pediatricians connected with medical schools in New York City selected six experienced pediatricians to assist in the experiment. These six physicians were asked to examine independently the same group of 108 11-year old boys and rate their nutritional condition in terms of the Dunfermline scale of "Excellent," "Good," "Fair," and "Poor." The 108 boys represented the entire 11-year old population of a cooperating institution in the city. Both those who were residents in the institution and those who resided outside were included. So far as could be determined no factor of selection was operating to interfere with the representativeness of the sample.

Each boy was stripped to his waist and carefully examined by each of the six physicians. If at all in doubt, the physician had the privilege of completely disrobing a boy and making more complete observations. Each physician was allowed as much time as he chose for the examination before deciding upon the final nutritional rating.

The results of this investigation were disconcerting. The physicians differed markedly in the number of children which they found in poor nutritional condition. According to one of the physicians, 15 of the 108 were malnourished (i. e., recorded as "Poor" with reference to nutrition) while another found only 2 whom he considered malnourished. The other 4 physicians selected 12, 10, 7, and 6. But even more confusing was the fact that children classed as ma-l nourished by one physician frequently were not the same children that were rated malnourished by another physician. In fact, one of the boys rated "Poor" by the physician who found only two in the "Poor" condition group was not considered "Poor" by any one of the other physicians. In all there were 25 of the 108 boys rated "Poor" by at least 1 of the physicians, but only 1 who was so rated by the entire group of doctors. Only 3 of the 25 were rated "Poor" by as many as 4 of the 6 physicians. Two of the cases were given every rating in the scale; that is, one of the doctors rated them "Excellent," another rated them "Good," another "Fair," and the fourth "Poor." With such disagreement as this, one can truthfully say that whether a child is rated as malnourished or not depends more on the physician who is the examiner than it does on the actual condition of the child.

A similar investigation was carried out on 113 girls at an institution in New Jersey. Each girl was examined independently by five women physicians selected in the same manner as were the men. The examinations were made under the same favorable conditions that were provided for the first experiment.

In this experiment there was much more uniformity in the proportion of children found in the "Poor" nutrition group than was true of the experiment with the men physicians. Each physician marked about 30 of the cases as malnourished (a rating of "Poor"), the actual numbers being 32, 32, 31, 31, and 26. The lack of agreement in the ratings of individual cases, however, was even more striking than in the first instance. Of the 113 children, there were 65 (over one-half) who were rated "Poor" by at least 1 of the physicians. There were only 6 of these 65 children, however, on whom all physicians agreed that the nutritional condition was poor. Again, it was found that two of the cases marked "Poor" by one physician were rated "Fair" by another, "Good" by another, and "Excellent" by a fourth physician.

Similar experiments were carried out with other physicians on smaller groups of children, but in each experiment the disagreements were equally great, *indicating that the rating of nutritional status which any child is given depends to a large extent on which doctor makes the rating.*

How serious are these disagreements in terms of the purposes for which ratings are usually made? Do they interfere with the determination of general trends, or the comparisons of findings in different localities? It is obvious from the first experiment that the proportion of children in any given locality who would be marked malnourished depends much more on the physician who examines the children than upon the actual amount of malnutrition present. If the physicians in the two localities differed as widely in their ratings as the two extreme physicians in the first experiment, then one of the localities would have reported over seven times as many malnourished children as the other when actually there could be no difference in the nutritional status of the two groups of children.

TABLE 1.—*Proportion of school children found malnourished by school physicians, New York City, 1927–34* [1]

Year	Number of children examined	Number malnourished	Percent malnourished	Year	Number of children examined	Number malnourished	Percent malnourished
1927	368,353	49,855	13.5	1931	307,438	52,478	17.0
1928	414,594	56,433	13.6	1932	336,903	71,777	21.1
1929	392,425	52,637	13.4	1933	346,074	68,931	19.9
1930	380,928	61,398	16.1	1934	272,897	49,880	18.1

[1] Reproduced by courtesy of the New York City Health Department.

An example of the way in which circumstances may influence the proportion of children recorded as malnourished is afforded by some data from New York City. Since 1927 annual tabulations have been made of the proportion of malnourished children found during the regular school examinations. These data have been used in previous publications as indicating an increase in malnutrition during the depression period. From the figures in table 1 it is apparent that the two major increases in proportion of malnourished children occurred in 1930 and in 1932. In this connection it should be pointed out that an acting director of the school health service work was appointed during the latter part of 1929, and that he was superseded by a second acting director in 1931. Is it not possible that the increases in recorded malnutrition may have resulted from the stress placed on the subject by these new administrators? [2]

Thus the *change in the proportion* of children who are reported as malnourished from one time to another may depend upon the physician who makes the examination or the circumstances under which the rating was made.

The practical significance of these disagreements in terms of individual children is equally serious when the nutritional ratings are made the basis for selecting children to whom special services will be rendered, such as segregation in nutrition classes, special feeding, nursing visits to the home, and morning and afternoon rest periods. The choice of the children to receive these services may depend upon the particular physician who examined them. Suppose the 113 girls included in the experiment had been enrolled in a given school and had been examined during the routine examinations by one of the physicians in the experiment, whom we shall call Doctor A, and those rated "Poor" were selected for special consideration. Thirty-two would have been chosen. But if Doctor B had been the school physician she would have selected only 17 of those rated "Poor" by Doctor A and 15 others *not* selected by Doctor A. It may be assumed that the 32 children who were given the special consideration provided for the undernourished children would profit therefrom, but *which 32* should be given the attention? Are there not others who are more in need than many of the girls in either of these groups? Is it possible, therefore, to justify the extra expenditure for a special group of children selected on the basis of estimates that disagree so widely?

The portrayal of these wide disagreements in the judgments of physicians is not made with the intention of discrediting the physicians or of discounting the value of their judgments when properly made. In the best private practice, physicians do not often make such judgments of a child's condition on a single examination. They either know the clinical history of the child and his hereditary background, or they take time to obtain it. They are either acquainted with the child and his peculiarities of structure and function or they observe him over a sufficiently long period to learn the significance of his variations from the normal. But, when a physician must estimate a child's nutritional status after a single brief examination, without a medical history, such as is ordinarily given in schools or on surveys his judgments are robbed of their value and the wide disagreements herein described arise.

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[2] It is recognized that one cannot argue cause and effect because of two occurrences that happen together or in proper sequence, but this limitation applies equally well to the conclusion that the increase in malnutrition was caused by the depression.

The implications of the data are twofold. To the practical administrator interested in improving nutritional conditions in his community the findings are particularly significant. They indicate the futility of nutritional programs that give special attention to a few cases regarded as deficient in nutritional status, on the basis of a routine physical examination by a physician. The errors in the doctor's estimates are too great to justify the extra effort given to the individuals chosen. Instead, public programs might be focused on the discovery of those individuals who have faulty food habits, or whose behavior symptoms, such as failure to gain in weight, lack of stamina, and lassitude, suggest the need for medical advice. The physician would concentrate on these cases, giving them a detailed medical examination supplemented by history and such laboratory tests as are indicated, in the interest of *preventing* the occurrence of malnutrition as well as correcting it after it occurs.

To the public health analyst the data show the high probability of error when physicians' judgments based on a single examination of nutritional status serve as the data for conclusions concerning either the prevalence of malnutrition, or the relative value of various administrative programs in improving the nutritional status of groups. It would seem, therefore, highly desirable to discontinue studies or surveys of nutritional status where physicians' judgments from a single inspection are being used as the original data for conclusions, and to concentrate on the development and validation of better methods of determining the nutritional status of children.

SUMMARY

In routine examinations, physicians differ widely in their estimates of the nutritional status of the same children. The differences in judgments are so great that estimates based on a single examination are of little value in determining the relative amount of malnutrition among any group of children at any one time or changes in the amount from one time to another. Neither are these nutritional estimates reliable bases for determining which children of a group are malnourished.

It is therefore suggested that practical nutritional programs be focused on correcting the faulty food habits of children rather than expending energy on routine examinations to determine nutritional status. It is also proposed that research workers concentrate on the construction of valid methods of determining nutritional status rather than making surveys which are of doubtful significance because of the inaccuracies of the estimates upon which their findings are based.

PROVISIONAL MORTALITY STATISTICS FOR 1936, BY CAUSE

The accompanying table, issued by the Bureau of the Census,[1] gives the number of deaths (exclusive of stillbirths) and the death rates, by important causes, for the United States for 1936, and comparisons with 1934 and 1935. The figures for 1936 are provisional; those for the other years are final.

A table giving the total numbers of deaths and the death rates for all causes, by States, for 1936 and 1935, and a summary for the expanding registration area since it was established in 1880, by years since 1900 and by census years for 1880, 1890, and 1900, was published in the Public Health Reports for February 4, 1938 (pp. 168–171).

As compared with 1934 and 1935, the death rates for 1936 were most favorable with respect to the common communicable diseases, excepting influenza. Pneumonia also recorded a higher death rate than in either of the 2 preceding years. Especially notable are the higher rates for two of the chronic, so-called "degenerative," diseases. The rate for heart diseases increased from 46.3 per 100,000 in 1934 to 56.1 in 1936, and that for cerebral hemorrhage from 77.3 in 1934 and 76.6 in 1935 to 81.2 in 1936. The rate for nephritis remained approximately the same as in the 2 preceding years, but the cancer rate was 111.1 per 100,000 as compared with 106.2 in 1934 and 107.9 in 1935. The death rate from automobile accidents increased to 27.8, as compared with a rate of 26.8 in each of the 2 preceding years.

Number of deaths (exclusive of stillbirths) and death rates, from selected causes, United States, 1934–36

[Number and rate for 1936 are provisional]

Cause of death	Number of deaths			Rate per 100,000 estimated population		
	1936	1935	1934	1936	1935	1934
Total	1,479,228	1,392,752	1,396,903	1,151.8	1,092.2	1,103.2
Typhoid and paratyphoid fever (1, 2)	3,182	3,531	4,237	2.5	2.8	3.3
Smallpox (6)	35	25	24	(1)	(1)	(1)
Measles (7)	1,267	3,907	6,986	1.0	3.1	5.5
Scarlet fever (8)	2,493	2,718	2,524	1.9	2.1	2.0
Whooping cough (9)	2,666	4,753	7,518	2.1	3.7	5.9
Diphtheria (10)	3,065	3,901	4,159	2.4	3.1	3.3
Influenza (11)	33,810	28,230	21,868	26.3	22.1	17.3
Dysentery (13)	3,122	2,436	3,373	2.4	1.9	2.7
Erysipelas (15)	2,006	2,106	1,917	1.6	1.7	1.5
Acute poliomyelitis and acute polioencephalitis (16)	780	1,040	852	.6	.8	.7
Lethargic or epidemic encephalitis (17)	851	857	923	.7	.7	.7
Epidemic cerebrospinal meningitis (18)	3,020	2,657	1,272	2.4	2.1	1.0
Tuberculosis of respiratory system (23)	65,042	63,488	64,706	50.6	49.8	51.1
Tuberculosis of meninges and central nervous system (24)	1,841	1,963	2,109	1.4	1.5	1.7
Other forms of tuberculosis (25–32)	4,643	4,629	4,794	3.6	3.6	3.8
Syphilis (34)	12,612	11,590	11,726	9.8	9.1	9.3
Malaria (38)	3,943	4,435	4,520	3.1	3.5	3.6
Cancer and other malignant tumors (45–53)	142,612	137,649	134,428	111.0	107.9	106.2
Rheumatism and gout (56–58)	4,005	3,961	4,027	3.1	3.1	3.2
Diabetes mellitus (59)	30,406	28,364	28,000	23.7	22.2	22.1

[1] Less than 1/10 of 1 per 100,000 estimated population.

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[1] Vital Statistics—Special Reports, Vol. 5, No. 14, p. 37, January 28, 1938.

Number of deaths (exclusive of stillbirths) and death rates, from selected causes, United States, 1934–36—Continued

Cause of death	Number of deaths			Rate per 100,000 estimated population		
	1936	1935	1934	1936	1935	1934
Pellagra (62)	3,740	3,543	3,602	2.9	2.8	2.8
Diseases of the blood and blood-making organs (70–74)	10,396	10,069	10,250	8.1	7.9	8.1
Alcoholism (75)	3,714	3,349	3,655	2.9	2.6	2.9
Other diseases of nervous system and of organs of special sense (78–81, 83–89)	26,981	26,007	26,255	21.0	20.4	20.7
Cerebral hemorrhage and softening (82*a*, *c*)	104,333	97,637	97,868	81.2	76.6	77.3
Cerebral embolism and thrombosis (82*b*)	8,456	7,375	6,392	6.6	5.8	5.0
Hemiplegia and other paralysis, cause unspecified (82*d*)	3,772	4,046	3,850	2.9	3.2	3.0
Diseases of the heart (90–95)	341,350	312,333	303,724	265.8	244.0	239.9
Other diseases of the circulatory system (96–103)	29,325	28,453	29,572	22.8	22.3	23.4
Other diseases of the respiratory system (104, 105, 110–114)	11,197	10,196	10,161	8.7	8.0	8.0
Bronchitis (106)	4,342	3,966	4,145	3.4	3.1	3.3
Bronchopneumonia (107)	47,288	42,621	41,923	36.8	33.4	33.1
Other forms of pneumonia (108, 109)	72,090	61,774	58,650	56.1	48.4	46.3
Diarrhea and enteritis (under 2 years) (119)	15,613	13,204	17,019	12.2	10.4	13.4
Diarrhea and enteritis (2 years and over) (120)	5,338	4,760	6,192	4.2	3.7	4.9
Appendicitis (121)	16,480	16,142	18,129	12.8	12.7	14.3
Hernia, intestinal obstruction (122)	13,433	13,161	13,023	10.5	10.3	10.3
Cirrhosis of the liver (124)	10,587	10,083	9,733	8.2	7.9	7.7
Other diseases of the digestive system (115–118, 123, 125–129)	32,125	32,309	31,805	25.0	25.3	25.2
Nephritis (130–132)	106,865	103,516	106,584	83.2	81.2	84.2
Other diseases of the genitourinary system (133–138)	16,049	15,196	14,802	12.5	11.9	11.7
Diseases of female genital organs (not specified as venereal) (139)	3,965	3,995	3,785	3.1	3.1	3.0
Puerperal septicemia (140, 142*a*, 145)	4,606	5,174	5,118	3.6	4.1	4.0
Other puerperal causes (141, 142*b*–144, 146–150)	7,576	7,370	7,741	5.9	5.8	6.1
Congenital malformations, diseases of early infancy (157–161)	63,857	63,054	66,988	49.7	49.4	52.9
Suicide (163–171)	18,293	18,214	18,828	14.2	14.3	14.9
Homicide (172–175)	10,232	10,587	12,055	8.0	8.3	9.5
Automobile accidents (primary) (210)	35,761	34,183	33,980	27.8	26.8	26.8
Railroad and automobile collisions (206)	1,697	1,587	1,457	1.3	1.2	1.2
Streetcar and automobile collisions (208)	269	253	332	.2	.2	.3
Motorcycle accidents (211)	362	346	332	.3	.3	.3
Other accidents, etc. (176–198, 201–205, 207, 209, 212–214)	72,159	63,598	65,038	56.2	49.9	51.4
Unknown and ill-defined (199, 200)	21,110	20,552	20,929	16.4	16.1	16.5
All other causes	34,466	31,859	32,933	26.8	25.0	25.5

DEATHS DURING WEEK ENDED JANUARY 29, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Jan. 29, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	9,151	[1] 10,682
Average for 3 prior years	9,539	
Total deaths, first 4 weeks of year	36,669	44,052
Deaths under 1 year of age	536	[1] 616
Average for 3 prior years	562	
Deaths under 1 year of age, first 4 weeks of year	2,159	2,608
Data from industrial insurance companies:		
Policies in force	69,793,644	69,041,422
Number of death claims	14,587	15,769
Death claims per 1,000 policies in force, annual rate	10.9	11.9
Death claims per 1,000 policies, first 4 weeks of year, annual rate	10.0	11.8

[1] Data for 85 cities.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred while leaders (......) indicate that cases or deaths may have occurred, although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 5, 1938, and Feb. 6, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 5, 1938	Week ended Feb. 6, 1937	Week ended Feb. 5, 1938	Week ended Feb. 6, 1937	Week ended Feb. 5, 1938	Week ended Feb. 6, 1937	Week ended Feb. 5, 1938	Week ended Feb. 6, 1937
New England States:								
Maine	......	1	4	1,688	150	26	0	0
New Hampshire	......	......	2	7	79	86	0	0
Vermont	......	......	......	......	240	4	0	0
Massachusetts	8	4	......	......	136	903	2	3
Rhode Island	......	1	......	......	4	198	0	0
Connecticut	4	3	12	536	11	346	0	1
Middle Atlantic States:								
New York	31	46	[1] 16	[1] 119	4,706	299	12	14
New Jersey	19	17	13	117	1,315	708	1	8
Pennsylvania	50	52	......	......	7,960	209	4	8
East North Central States:								
Ohio	21	46	......	242	1,266	66	0	7
Indiana	49	16	......	294	724	9	1	2
Illinois	49	46	54	275	4,747	11	3	9
Michigan	10	9	6	10	961	35	0	2
Wisconsin	2	1	51	1,028	2,001	23	0	1
West North Central States:								
Minnesota	2	4	5	4	19	29	1	0
Iowa	2	4	12	425	45	3	1	8
Missouri	20	25	203	1,487	1,231	15	8	7
North Dakota	1	......	2	363	19	1	3	4
South Dakota	3	......	......	91	......	......	2	2
Nebraska	11	7	......	48	5	......	0	0
Kansas	19	5	10	2,320	395	3	0	5
South Atlantic States:								
Delaware	......	1	......	7	83	173	0	0
Maryland [3]	11	8	28	398	21	309	0	5
District of Columbia	5	14	2	42	13	32	0	6
Virginia	25	31	......	......	547	183	1	5
West Virginia	13	21	42	1,313	232	10	4	5
North Carolina	36	30	33	27	1,241	156	4	5
South Carolina [3]	5	3	636	968	307	40	0	2
Georgia [3]	7	8	......	763	456	......	2	4
Florida [3]	17	12	10	44	223	1	0	2
East South Central States:								
Kentucky	8	8	77	358	568	50	16	8
Tennessee	13	10	172	720	645	14	4	4
Alabama [3]	17	15	289	614	215	2	6	1
Mississippi [2]	5	8	......	......	......	......	0	0

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 5, 1938, and Feb. 6, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 5, 1938	Week ended Feb. 6, 1937	Week ended Feb. 5, 1938	Week ended Feb. 6, 1937	Week ended Feb. 5, 1938	Week ended Feb. 6, 1937	Week ended Feb. 5, 1938	Week ended Feb. 6, 1937
West South Central States:								
Arkansas	17	3	242	946	204	2	1	1
Louisiana	12	14	24	291	1	6	3	0
Oklahoma [4]	20	10	169	874	48	4	2	4
Texas [3]	80	60	916	4,481	140	426	4	8
Mountain States:								
Montana	1	2	-------	1,035	9	19	0	1
Idaho	-------	1	0	184	5	76	0	0
Wyoming	-------	1	-------	80	6	1	1	0
Colorado	5	5	-------	-------	89	5	0	1
New Mexico	2	5	9	244	163	20	2	0
Arizona	9	5	117	1,113	3	294	0	0
Utah [2]	3	1	-------	-------	123	39	0	0
Pacific States:								
Washington	5	5	2	430	28	42	0	2
Oregon	4	1	59	1,111	19	11	1	1
California	32	33	100	7,762	311	91	2	9
Total	648	617	3,323	32,868	31,667	4,980	86	145
First 5 weeks of the year	3,409	3,124	14,951	141,696	102,936	21,770	463	705

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Feb. 5, 1938	Week ended Feb. 6, 1937	Week ended Feb. 5, 1938	Week ended Feb. 6, 1937	Week ended Feb. 5, 1938	Week ended Feb. 6, 1937	Week ended Feb. 5, 1938	Week ended Feb. 6, 1937	Week ended Feb. 5, 1938
New England States:									
Maine	0	0	23	25	0	0	0	2	71
New Hampshire	1	0	6	6	0	0	0	0	4
Vermont	0	0	13	81	0	0	0	0	18
Massachusetts	0	0	274	264	0	0	2	0	111
Rhode Island	0	0	21	64	0	0	0	0	34
Connecticut	0	0	93	106	0	0	2	0	67
Middle Atlantic States:									
New York	1	1	661	763	0	2	6	11	472
New Jersey	0	1	143	161	0	0	1	1	144
Pennsylvania	0	1	653	496	0	0	21	8	411
East North Central States:									
Ohio	0	0	316	408	1	9	2	3	115
Indiana	0	0	211	197	69	5	1	0	18
Illinois	0	1	714	628	44	31	4	6	93
Michigan	1	2	474	500	19	1	4	8	132
Wisconsin	1	0	185	295	2	21	0	1	129
West North Central States:									
Minnesota	0	0	137	151	16	3	1	0	33
Iowa	0	0	285	236	33	43	4	0	42
Missouri	1	0	229	268	31	63	4	2	108
North Dakota	0	0	33	40	29	13	0	1	31
South Dakota	0	0	17	75	20	11	0	0	14
Nebraska	0	0	70	79	8	4	0	0	8
Kansas	0	1	226	329	10	29	1	0	113
South Atlantic States:									
Delaware	0	0	6	6	0	0	0	0	21
Maryland [2]	1	0	56	41	0	0	1	3	64
District of Columbia	0	0	21	13	0	0	0	0	9
Virginia	0	1	30	45	3	0	2	12	97
West Virginia	1	1	34	46	0	0	4	5	99
North Carolina	0	0	39	40	1	1	4	6	281
South Carolina [3]	2	0	7	10	0	0	2	2	57
Georgia [3]	0	6	13	20	0	0	2	3	59
Florida [3]	0	0	13	7	0	0	4	0	55

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 5, 1938, and Feb. 6, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Feb. 5, 1938	Week ended Feb 6, 1937	Week ended Feb. 5, 1938	Week ended Feb. 6, 1937	Week ended Feb. 5, 1938	Week ended Feb. 6, 1937	Week ended Feb 5, 1938	Week ended Feb. 6, 1937	Week ended Feb 5, 1938
East South Central States:									
Kentucky	1	1	76	24	32	0	2	2	71
Tennessee	0	0	40	19	3	1	1	6	46
Alabama [3]	0	0	14	19	2	1	6	4	14
Mississippi [2]	3	3	4	7	17	1	4	1	-------
West South Central States:									
Arkansas	0	2	8	10	12	2	4	1	27
Louisiana	0	0	15	5	0	0	11	6	2
Oklahoma [4]	1	0	52	34	34	0	2	7	33
Texas [3]	0	1	162	102	62	7	11	8	269
Mountain States:									
Montana	0	0	35	60	9	14	0	0	31
Idaho	0	0	17	13	14	8	2	0	19
Wyoming	0	0	27	15	1	11	0	1	25
Colorado	0	0	24	84	6	2	1	0	13
New Mexico	0	0	5	24	0	2	3	3	35
Arizona	1	0	13	22	1	0	1	0	37
Utah [2]	0	0	106	23	5	0	0	0	83
Pacific States:									
Washington	1	0	89	28	32	0	1	1	122
Oregon	2	0	78	45	27	20	0	0	30
California	3	2	236	273	67	8	5	4	261
Total	21	24	6,004	6,207	610	313	126	118	4,028
First 5 weeks of year	106	121	29,791	29,873	3,019	1,457	590	611	19,946

[1] New York City only.

[2] Week ended earlier than Saturday.

[3] Typhus fever, week ended Feb. 5, 1938, 20 cases, as follows: South Carolina, 1; Georgia, 6; Florida, 6; Alabama, 3; Texas, 4.

[4] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
December 1937										
Massachusetts	4	18	-------	-------	349	-------	1	926	0	19
Puerto Rico	0	32	143	7,004	72	-------	0	1	0	22
January 1938										
Connecticut	6	24	43	-------	61	-------	1	345	0	3
Delaware	0	4	2	-------	28	-------	0	68	0	0
North Carolina	13	121	134	1	3,434	27	3	218	4	23

Summary of monthly reports from States—Continued

December 1937

	Cases
Massachusetts:	
Chickenpox	1,670
Dysentery, amoebic	1
Dysentery, bacillary	19
Encephalitis, epidemic or lethargic	1
German measles	72
Mumps	298
Ophthalmia neonatorum	73
Paratyphoid fever	4
Rabies in animals	4
Septic sore throat	13
Tetanus	1
Trichinosis	1
Undulant fever	8
Whooping cough	732
Puerto Rico:	
Chickenpox	21
Dysentery	79
Filariasis	2
Mumps	4
Tetanus	9
Tetanus, infantile	1
Whooping cough	109

January 1938

	Cases
Chickenpox:	
Connecticut	891
Delaware	138
North Carolina	991
Conjunctivitis, infectious:	
Connecticut	3
Dysentery:	
Connecticut (bacillary)	11
German measles:	
Connecticut	16
North Carolina	38
Lead poisoning:	
Connecticut	1
Mumps:	
Connecticut	1,061
Delaware	60
Ophthalmia neonatorum:	
Connecticut	2
North Carolina	1
Paratyphoid fever:	
Connecticut	2
North Carolina	5

January 1938—Contd.

	Cases
Rabies in animals:	
Connecticut	2
Rocky Mountain spotted fever:	
North Carolina	1
Septic sore throat:	
Connecticut	16
North Carolina	14
Trichinosis:	
Connecticut	2
Tularaemia:	
North Carolina	6
Typhus fever:	
North Carolina	11
Undulant fever:	
Connecticut	6
Vincent's infection:	
North Carolina	3
Whooping cough:	
Connecticut	172
Delaware	32
North Carolina	1,470

WEEKLY REPORTS FROM CITIES

City reports for week ended Jan. 29, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	225	1,621	196	2,826	1,057	1,967	29	402	20	1,178	--------
Current week [1]	185	[2] 304	77	4,995	839	1,702	41	354	19	998	--------
Maine:											
Portland	0	------	0	6	4	0	0	2	0	19	18
New Hampshire:											
Concord	0	------	0	0	1	0	0	0	0	1	11
Manchester	1	------	2	0	4	16	0	0	0	0	40
Nashua	0	------	--------	0	-------	0	0	-------	0	0	16
Vermont:											
Barre	-------	------	--------	-------	-------	-------	-------	-------	-------	-------	--------
Burlington	0	------	0	1	0	1	0	0	0	1	10
Rutland	0	------	0	0	0	0	0	0	0	0	2
Massachusetts:											
Boston	1	------	2	103	17	92	0	11	0	18	184
Fall River	0	------	0	1	3	3	0	1	0	11	33
Springfield	0	------	0	1	5	1	0	2	0	13	41
Worcester	0	------	0	4	5	6	0	4	1	0	55
Rhode Island:											
Pawtucket	0	------	0	0	2	4	0	0	0	0	15
Providence	0	------	0	0	11	13	0	4	0	24	87
Connecticut:											
Bridgeport	0	1	1	0	2	13	0	0	0	0	30
Hartford	0	2	0	0	12	27	0	2	0	5	65
New Haven	0	------	0	0	7	3	0	0	0	3	51
New York:											
Buffalo	0	------	0	2	16	30	0	4	0	23	152
New York	32	14	7	148	124	278	0	82	4	208	1,573
Rochester	0	2	0	3	4	6	0	2	0	0	71
Syracuse	2	------	0	10	4	7	0	3	0	10	62
New Jersey:											
Camden	0	------	0	51	1	5	0	2	0	0	40
Newark	0	2	1	15	13	18	0	6	0	16	118
Trenton	0	1	0	22	7	4	0	0	0	5	41
Pennsylvania:											
Philadelphia	3	4	3	260	31	130	0	21	1	32	558
Pittsburgh	3	7	6	304	28	52	0	12	0	27	218
Reading	0	------	0	1	1	4	0	3	0	1	25
Scranton	0	------	--------	37	-------	1	0	-------	0	7	--------

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[1] Figures for Barre, Vt., estimated; report not received.

[2] Includes delayed reports.

City reports for week ended Jan. 29, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Ohio:											
Cincinnati	4	------	1	0	18	15	0	10	0	8	147
Cleveland	4	13	1	116	22	59	0	5	1	29	210
Columbus	1	------	0	96	5	9	0	4	0	6	85
Toledo	0	3	2	66	5	18	0	6	0	18	81
Indiana:											
Anderson	0	------	0	0	1	7	10	0	0	11	5
Fort Wayne	1	------	0	3	4	5	0	1	0	0	33
Indianapolis	40	------	2	37	19	12	0	5	0	7	125
Muncie	0	------	0	60	5	0	0	0	0	0	14
South Bend	1	------	0	3	2	6	0	2	0	0	19
Terre Haute	2	------	0	7	0	1	1	0	0	0	17
Illinois:											
Alton	0	------	0	2	0	4	0	1	0	0	3
Chicago	13	14	0	1,467	51	259	0	35	0	41	755
Elgin	0	------	0	2	2	8	0	1	0	4	8
Moline	1	1	1	34	1	9	0	1	0	0	9
Springfield	0	2	0	68	5	8	9	0	0	0	23
Michigan:											
Detroit	10	6	2	474	22	191	0	11	2	77	255
Flint	0	------	0	3	8	39	0	1	0	19	28
Grand Rapids	0	------	1	0	6	23	0	0	0	8	46
Wisconsin:											
Kenosha	0	------	0	1	3	4	0	0	0	1	7
Madison	0	------	0	1	0	3	0	0	0	0	9
Milwaukee	2	------	0	747	10	23	0	3	0	26	120
Racine	0	------	0	2	0	9	0	0	0	4	13
Superior	0	------	0	0	2	3	0	0	0	0	9
Minnesota:											
Duluth	0	------	1	1	2	5	0	0	0	11	18
Minneapolis	0	------	2	2	10	22	1	1	0	3	107
St. Paul	0	------	0	1	12	5	16	1	0	3	59
Iowa:											
Cedar Rapids	0	------	--------	0	-------	2	0	-------	0	3	--------
Davenport	0	------	--------	19	-------	1	0	-------	0	0	--------
Des Moines	0	------	--------	1	-------	31	0	-------	0	2	31
Sioux City	0	------	--------	0	-------	2	0	-------	0	1	--------
Waterloo	0	------	--------	0	-------	4	1	-------	0	0	--------
Missouri:											
Kansas City	2	------	1	47	20	23	0	5	0	1	128
St. Joseph	0	------	0	0	3	2	0	0	0	0	24
St. Louis	8	------	4	103	25	64	2	4	1	1	284
North Dakota:											
Fargo	0	------	0	2	0	4	0	0	0	1	6
Grand Forks	0	------	--------	0	-------	2	0	-------	0	0	--------
Minot	0	------	0	0	0	1	1	0	0	11	7
South Dakota:											
Aberdeen	0	------	--------	0	-------	0	0	-------	0	8	--------
Nebraska:											
Omaha	0	------	0	0	9	8	0	1	0	1	62
Kansas:											
Lawrence	0	------	0	0	0	0	0	0	0	2	8
Topeka	0	------	1	2	6	1	0	0	0	10	25
Wichita	1	------	0	1	9	7	0	0	0	1	32
Delaware:											
Wilmington	1	------	0	8	2	5	0	0	0	5	35
Maryland:											
Baltimore	10	17	7	6	32	31	0	10	1	21	254
Cumberland	0	------	0	0	2	0	0	0	0	4	12
Frederick	0	------	0	0	0	0	0	0	0	0	2
District of Columbia:											
Washington	4	3	2	12	21	15	0	12	0	5	153
Virginia:											
Lynchburg	2	------	0	0	0	0	0	1	0	0	14
Norfolk	2	------	0	75	2	8	0	4	0	1	29
Richmond	0	------	2	59	10	4	0	1	0	0	61
Roanoke	1	------	1	2	0	0	0	1	1	0	18
West Virginia:											
Charleston	0	------	0	23	3	1	0	1	0	1	22
Huntington	1	------	--------	11	-------	2	0	-------	0	1	--------
Wheeling	0	------	0	4	2	4	0	2	0	1	22
North Carolina:											
Gastonia	0	------	--------	1	-------	0	0	-------	0	0	--------
Raleigh	1	------	0	0	3	0	0	2	0	24	18
Wilmington	0	------	0	1	2	2	0	0	0	8	17
Winston-Salem	1	------	0	4	0	0	0	0	0	41	21

City reports for week ended Jan. 29, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
South Carolina:											
Charleston	0	24	1	56	4	0	0	0	1	2	22
Florence	0			1	2	0	0		1	0	13
Greenville	0			2	1	1	0		0	8	4
Georgia:											
Atlanta	3	15	0	128	5	4	0	2	0	2	84
Brunswick	0		0	0	0	0	0	0	0	0	
Savannah	0	[2] 114	2	10	3	3	0	2	0	2	41
Florida:											
Miami	1	1	1	52	2	0	0	4	0	0	42
Tampa	2	2	2	0	2	1	0	1	1	0	27
Kentucky:											
Ashland	0			14		0	0		0	3	
Covington	0	1	0	2	1	1	0	1	0	2	16
Lexington	0	3		0	3	0	0	1	0	0	18
Louisville	3	10	1	219	7	51	0	4	0	13	66
Tennessee:											
Knoxville	3	2	1	11	3	2	0	1	0	6	27
Memphis	1	1	1	186	6	2	0	8	0	3	90
Nashville	0		2	10	4	2	0	1	0	2	47
Alabama:											
Birmingham	0	9	2	53	14	5	0	3	0	1	71
Mobile	0		5	3	1	1	0	0	0	0	27
Montgomery	0	5		11		1	0		0	1	
Arkansas:											
Fort Smith	0			5		0	0		0	1	
Little Rock	0		0	100	10	0	0	0	0	1	12
Louisiana:											
Lake Charles	0		0	0	0	1	0	0	0	1	3
New Orleans	7	10	2	2	25	6	0	15	1	2	192
Shreveport	0		0	0	19	3	0	0	1	0	72
Oklahoma:											
Oklahoma City	1		1	0	4	7	0	1	0	0	41
Tulsa	1			2		4	0		0	0	
Texas:											
Dallas	2	3	3	3	9	7	0	1	0	1	67
Fort Worth	2		2	1	8	7	1	0	0	3	47
Galveston	0		0	0	1	0	0	1	0	0	9
Houston	3		0	0	8	5	0	4	1	0	73
San Antonio	3		1	0	13	1	0	10	0	0	86
Montana:											
Billings	0		0	0	0	0	0	0	0	0	4
Great Falls	0		0	0	7	2	2	0	0	12	15
Helena	0		0	1	0	0	0	0	0	4	6
Missoula	0		0	0	1	1	0	0	0	0	2
Idaho:											
Boise	0		0	0	2	0	1	0	0	0	11
Colorado:											
Colorado Springs	0		0	0	0	3	0	1	0	7	14
Denver	6		1	150	9	14	0	2	0	1	92
Pueblo	1		0	2	1	0	0	0	0	3	5
New Mexico:											
Albuquerque	0		0	13	0	0	0	1	1	5	9
Utah:											
Salt Lake City	0		1	24	2	11	1	0	0	1	42
Washington:											
Seattle	3		1	2	6	6	0	1	0	41	83
Spokane	0		0	0	1	0	1	0	1	8	30
Tacoma	0		0	0	1	11	2	0	0	11	28
Oregon:											
Portland	0	2	1	1	5	24	0	2	0	0	90
Salem	0	3		0		1	0		0	0	
California:											
Los Angeles	3	20	4	10	39	44	4	7	1	16	350
Sacramento	0	13	0	0	7	1	0	2	0	47	37
San Francisco	1	5	1	1	13	10	1	14	0	45	202

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[2] Includes delayed reports.

City reports for week ended Jan. 29, 1938—Continued

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
New York:			
Buffalo	3	1	0
New York	4	1	1
Pennsylvania:			
Philadelphia	1	0	0
Pittsburgh	1	0	0
Illinois:			
Chicago	3	0	0
Michigan:			
Detroit	1	0	0
Minnesota:			
Minneapolis	0	0	1
Iowa:			
Des Moines	1	0	0
Missouri:			
Kansas City	1	0	0
St. Louis	0	1	0
Maryland:			
Baltimore	2	1	1
Kentucky:			
Louisville	0	0	1
Tennessee:			
Memphis	1	2	0
Alabama:			
Birmingham	3	0	0
Louisiana:			
New Orleans	2	1	1
Shreveport	0	3	0
Oklahoma:			
Oklahoma City	0	0	1
Texas:			
San Antonio	2	1	0
Utah:			
Salt Lake City	0	1	0
Oregon:			
Portland	0	1	0
California:			
San Francisco	0	1	0

Dengue.—Cases: Charleston, S. C., 2.

Encephalitis, epidemic or lethargic.—Cases: St. Louis, 1; Washington, 1.

Pellagra.—Cases: Florence, 1; Atlanta, 3; Brunswick, 1; Savannah, 5; Memphis, 2; San Francisco, 1.

Typhus fever.—Cases: Charleston, S. C., 1; Savannah, 1.

FOREIGN AND INSULAR

FINLAND

Communicable diseases—December 1937.—During the month of December 1937, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	468	Poliomyelitis	14
Dysentery	7	Scarlet fever	823
Influenza	2,809	Typhoid fever	14
Paratyphoid fever	36	Undulant fever	1

GERMANY

Elmshorn—Psittacosis.—During the period December 12, 1937, to January 8, 1938, 4 cases of psittacosis with 1 death occurred in Elmshorn, a small town near Hamburg, Germany. About 12 birds belonging to a private dealer became sick and all were killed. The report stated that full eradicative measures had been taken.

ITALY

Communicable diseases—4 weeks ended December 5, 1937.—During the 4 weeks ended December 5, 1937, cases of certain communicable diseases were reported in Italy as follows:

Disease	Nov. 8-14		Nov. 15-21		Nov. 22-28		Nov. 29-Dec. 5	
	Cases	Communes affected	Cases	Communes affected	Cases	Communes affected	Cases	Communes affected
Anthrax	20	18	16	14	17	16	17	17
Cerebrospinal meningitis	10	8	15	14	17	15	8	8
Chickenpox	216	86	220	84	321	103	317	109
Diphtheria	972	424	984	438	853	408	914	435
Dysentery	33	20	36	20	41	22	38	21
Hookworm disease	19	11	6	5	3	3	5	5
Lethargic encephalitis	--------	--------	--------	--------	1	1	--------	--------
Measles	781	177	1,066	199	1,082	211	1,680	247
Mumps	119	50	220	81	178	72	214	73
Paratyphoid fever	111	81	114	84	98	73	98	74
Poliomyelitis	48	42	46	36	31	27	33	27
Puerperal fever	35	35	30	28	43	43	31	30
Scarlet fever	456	171	368	145	368	158	328	123
Typhoid fever	778	420	754	391	627	300	545	328
Undulant fever	35	32	39	30	40	30	40	35
Whooping cough	251	73	258	81	286	96	237	83

JAMAICA

Communicable diseases—4 weeks ended January 22, 1938.—During the 4 weeks ended January 22, 1938, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis		3	Poliomyelitis		1
Chickenpox	8	7	Puerperal septicemia		2
Diphtheria	3	1	Scarlet fever		7
Dysentery (amoebic)	4	4	Tuberculosis	38	92
Leprosy	1	4	Typhoid fever	5	20

PANAMA CANAL ZONE

Notifiable diseases—October–December 1937.—During the months of October, November, and December, 1937, certain notifiable diseases, including imported cases, were reported in the Panama Canal Zone and terminal cities, as follows:

Disease	October		November		December	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chickenpox	7		5		6	
Diphtheria	4		13		3	
Dysentery (amoebic)	3	2	8	1	11	
Dysentery (bacillary)	5	3	2	1	7	1
Leprosy	2				1	
Lethargic encephalitis			2			
Malaria	84	4	72	3	85	5
Measles	67		30		13	
Meningococcus meningitis	2			1		
Mumps	67		31		53	
Pneumonia		33		18		23
Relapsing fever			1			
Scarlet fever	2				2	
Tuberculosis		35		21		32
Typhoid fever	3	1	3	1	3	1
Whooping cough	[1]14	2	[1]11	2	[1]7	1

[1] In Canal Zone only.

YUGOSLAVIA

Communicable diseases—4 weeks ended January 2, 1938.—During the 4 weeks ended January 2, 1938, certain communicable diseases were reported in Yugoslavia, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	20	3	Paratyphoid fever	18	
Cerebrospinal meningitis	19	4	Poliomyelitis	1	
Diphtheria and croup	902	80	Scarlet fever	317	2
Dysentery	16	3	Sepsis	9	6
Erysipelas	164	6	Tetanus	15	7
Lethargic encephalitis	2		Typhoid fever	584	55
Measles	135		Typhus fever	21	

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for January 28, 1938, pages 144–159. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

India—Rangoon.—During the week ended January 29, 1938, 1 fatal case of cholera was reported in Rangoon, India.

Indochina (French).—During the week ended January 29, 1938, 19 cases of cholera were reported in Annam Province and 9 cases of cholera were reported in Tonkin Province, French Indochina.

Plague

Hawaii Territory—Island of Hawaii—Hamakua District—Paauhau Sector.—A rat found on January 24, 1938, in Paauhau Sector, Hamakua District, Island of Hawaii, Hawaii Territory, has been proved positive for plague.

India—Allahabad.—During the week ended January 29, 1938, 1 fatal case of plague was reported in Allahabad, India.

Siam—Correction.—The report of 57 cases of plague with 57 deaths for the week ended October 2, 1937, in the Provinces of Siam, published on pages 1873, 1955, and 147 of the PUBLIC HEALTH REPORTS for December 17, and 31, 1937, and January 28, 1938, respectively, is an error. No plague was reported in Siam for this period.

Smallpox

Iraq—Amara Province.—During the week ended January 15, 1938, 6 cases of smallpox were reported in Amara Province, Iraq.

Yellow Fever

Brazil—Sao Paulo State—Cayua.—According to information dated February 8, 1938, yellow fever is present in Cayua, Sao Paulo State, Brazil.

Ivory Coast—Abidjan.—On February 2, 1938, 1 suspected case of yellow fever was reported in Abidjan, Ivory Coast.

Nigeria—Ijebu Ode.—On January 15, 1938, 1 case of yellow fever was reported in Ijebu Ode, Nigeria.

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UNITED STATES TREASURY DEPARTMENT

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IN THIS ISSUE

Uses, Toxicity, and Potential Industrial Hazard of Selenium
The Effects of Inhalation of Methyl Isobutyl Ketone Vapor
A Report of 1,000 Tests on Drinking Water Found on Trains

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THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg. Gen. ROBERT OLESEN, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

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PUBLIC HEALTH REPORTS

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SELENIUM AS A POTENTIAL INDUSTRIAL HAZARD[1]

By H. C. DUDLEY, *Assistant Biochemist, United States Public Health Service*

The discovery and widespread study of selenium as a causative and contributing factor in certain animal diseases have aroused the interest of investigators in the significance of the element as a potential industrial hazard. The work of many investigators has been reported within the past 5 years, dealing with various phases of the selenium problem insofar as it is associated with agricultural activities. A summary of the results of these various investigations is given by Byers (*7*) and Stenn (*15*). Hamilton (*8, 9*) reports that the examination of workers in a copper plant, employed in extracting and purifying selenium, revealed symptoms indicative of selenium poisoning. The author has shown (*4*) that men employed in similar work excrete selenium in the urine and exhibit symptoms similar to those noted by Hamilton.

From the results of investigations of the acute and chronic effects of ingestion of selenium compounds by animals (*3, 7*) and the pathological changes brought about by inhalation of hydrogen selenide (*6*), it is logical to conclude that when selenium in soluble or unstable combination gains entry to the organism in sufficient quantity, either by inhalation or ingestion, injurious effects will be produced. Prolonged absorption of sublethal amounts of such compounds will produce changes which are due primarily to the selenium absorbed.

The primary purpose of this article is to point out those industries which may have unrecognized hazards due to the processing of selenium-bearing materials. The necessity of studying individual conditions in order to preclude the possibility of industrial poisoning is of the greatest importance. Details of the methods developed for determination of selenium in atmosphere as dust or vapors are given in this paper. Likewise, a satisfactory method of urine examination is outlined. These procedures have proved satisfactory under a variety of conditions.

The increasing uses and application of the element and its compounds necessitates a warning that selenium in certain combinations is toxic. Certain processes may be expected to prove injurious to those employed in plants utilizing selenium unless adequate protective measures are taken.

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[1] From Laboratory of Industrial Hygiene, National Institute of Health

INDUSTRIAL SIGNIFICANCE OF SELENIUM

The chief source of selenium used in commercial quantities has been that derived as a byproduct from the electrolytic refining of copper. A study of trade literature shows that the first uses of selenium were largely confined to the glass and ceramic industry, where it was used as a glass decolorizer and in the production of red glass and glazes. Later, the rubber manufacturers made such demands on domestic copper refineries that selenium was no longer a drug on the market; large stores from former years were necessary to meet increased demands. There has been an increasing demand for selenium during the past few years, to such a degree that domestic supplies are insufficient to meet domestic requirements (table 1).

TABLE 1.—*Production and consumption of selenium in the United States* [1]

Year	Sales of domestic produced selenium	Imports of selenium	Domestic consumption	Year	Sales of domestic produced selenium	Imports of selenium	Domestic consumption
	Pounds	*Pounds*	*Pounds*		*Pounds*	*Pounds*	*Pounds*
1921	55,978	1,106	57,084	1929	344,288	3,592	347,880
1923	127,174	940	128,114	1931	292,234	2,189	294,423
1925	194,007	5,807	199,814	1933	331,963	1,755	333,718
1927	284,508	15,286	299,794	1935 [2]	232,831	179,331	412,162

[1] U. S. Bureau of Mines Inf. Circular 6317. Minerals Yearbook 1934 and 1936.
[2] Latest available figures.

NOTE.—Prices of selenium average approximately $1.80 per pound.

In the past 8 years new processes utilizing selenium have been developed, as evidenced by the increased number of United States and foreign patents. These new applications, listed below, coupled with the steadily increased use by the ceramic industry, have exhausted present domestic supplies, necessitating the importation in 1935 of 179,000 pounds of selenium.

Uses of selenium

Glass decolorizer.
Production of ruby glass.
Red and yellow glazes.
Paint and ink pigments.
Production and coloring of plastics.
Alloying of machineable stainless steels.
Alloying of free machining copper base alloys.
Rubber "accelerators" and antioxidants.
Fireproofing of electric cable.
Photoelectric apparatus.
Chemicals.

In order to meet the increasing demands for selenium, it will be necessary to open new sources of supply. Because of the chemical similarity of sulfur, selenium, and tellurium, it is known that sulfide ore deposits will, in general, contain selenium and tellurium in small amounts. The processing of these sulfide deposits may result in furnishing varying quantities of these elements as byproducts. Development of methods of extraction of the selenium from various minerals (table 2) and waste products may be expected to increase the supply of the element to keep pace with the increasing demands.

TABLE 2.—*Selenium content of certain minerals* [1]

Material	Selenium	Location
	Parts per million	
Cretaceous shale (Pierre)	103	Nebraska.
Do	23	Kansas.
Cretaceous shale	23	Colorado.
Do	57	Arizona.
Cretaceous shale (Niobrara)	55	Wyoming.
Do	22	Do.
Cretaceous chalk	30	South Dakota.
Cretaceous limestone	26	Nebraska.
Crude sulfur	8,350	Colorado.
Salt crust	200	Do.
Pyrites	55	South Carolina.
Do	75	Alabama.
Do	205	Nebraska.
Do	125	Virginia.
Do	250	Georgia.
Copper ore	7	Utah.
Copper concentrate	365	New Mexico.
Lead concentrate	385	Utah.
Zinc ore	430	Colorado.
Tellurium ore	430	Do.
Vanadium ore	125	Do.
	Percent	
Tiemanite ore	13.2	Utah.

[1] Taken from reference (*7*).

In an excellent résumé of his and others' work on the distribution of selenium in nature, Strock (*12*) states that the selenium content of the earth's crust approximates 0.005 percent. From detailed geological and mineralogical considerations, the conclusion is drawn that selenium may be expected in nearly all sulfur and sulfide ore deposits, with selenium-sulfur ratios from 1:10,000, an average value being 1:1,600.

Selenium has been reported in phosphate rocks from both foreign and domestic deposits. In general, certain western phosphates show greater amounts of selenium, ranging as high as 55 parts per million (*13*). It is also stated that selenium is volatilized completely when certain phosphates are calcined in the presence of water vapor.

While investigating the selenium content of a large number of soil samples, Byers made a most interesting observation as the result of certain determinations on soils taken from areas surrounding smelters. He stated, "A number of samples of soils and vegetation from areas subject to smelter fumes were examined. These include areas near Butte and Anaconda, Mont., Kennet, Calif., and Copper Hill, Tenn. In all cases selenium was found and in general a decrease in quantity as the distance from the smelter increased. This matter deserves fuller investigation." ((*7*), p. 74, Tech. Bull. 530.)

TOXICITY OF SELENIUM

The experimental work conducted by a large number of investigators on the effects on animals of ingested selenium compounds has shown conclusively that soluble selenium compounds are toxic, producing both acute and chronic physiological effects. The toxic effects of such ingestion, above very low threshold limits, are in direct proportion to the amount of selenium compound consumed. The acute effects of ingestion of soluble selenium compounds may be summarized as consisting primarily of early cellular destruction in the liver, with later pathological changes throughout the organism. The ingestion of small quantities of selenium compounds over a long period results in retrograde changes in the liver and kidneys, accompanied by general debility.

The reported experimental work on the effect of inhalation of selenium or its compounds is confined to the work done on the effects of inhalation of hydrogen selenide (*6*). Acute and subacute effects resulting from single exposures of guinea pigs to hydrogen selenide are, primarily, an early severe fatty metamorphosis of the liver and late hypertrophy of the spleen.

The effects of industrial exposures have been reported by Hamilton (*8*, *9*) and the author (*4*). These investigators report the following symptoms occurring in certain of the men employed at copper refineries extracting or purifying selenium: Pallor, gastrointestinal disturbances, garlicky odor of breath and perspiration, irritation of nose and throat (rose cold), coating of tongue, metallic taste in mouth, and nervousness.

The symptoms given above are not pathognomonic for selenium and are characteristic of metallic poisoning in general. However, an analysis for selenium in urine from workers who are suspected of being poisoned by the element should be made (*1*, *2*, *4*). This confirmatory urine analysis is reported for those men observed by Dudley (*4*).

The excretion of selenium in the urine is conclusive evidence that workers are absorbing selenium. However, more clinical and experimental laboratory work is necessary in order to establish a method of differential diagnosis, based on the quantity of selenium excreted in the urine.

A satisfactory method of analysis for urine samples containing selenium is that previously reported (*2*, *4*). The urine, oxidized by 30 percent hydrogen peroxide and concentrated nitric acid, is taken to near dryness on a steam bath, at which time 10 cc of concentrated sulfuric acid are added in order to displace the nitrates and carbonize any remaining organic material. After further heating to drive off the remaining nitric acid, the residue is taken up in 48 percent hydrobromic acid containing free bromine. The selenium is distilled into a receiver along with the hydrobromic acid and excess bromine. From this acid solution the selenium may be precipitated by sulfur dioxide and hydroxylamine hydrochloride. The quantitative estimation is carried out by filtering off the precipitate and redissolving in 48 percent hydrobromic acid containing 0.2 percent free bromine. This solution is then made to standard volume, 25 cc, and precipitated as before. Gum arabic is used to prevent settling of the precipitated selenium. The pink color produced is matched in standardized Nessler tubes with the color shown by standards of known content. Precipitation of standards and unknowns is carried out in an identical manner.

A slight modification of the reported technique is introduced so as to provide a more certain means of determining amounts of selenium as low as 0.01 mg. A first fraction of the distillate containing bromine and selenium is collected, amounting to about 75 cc. This fraction is in turn distilled so as to give a final volume of distillate of 20 cc. In this manner amounts of selenium of the order of 0.01 mg are easily seen after precipitation with sulfur dioxide and hydroxylamine hydrochloride, and standing for 2 or 3 days.

The probable presence of a volatile selenium compound in the urine made advisable the addition of the hydrogen peroxide prior to acidification with nitric acid. The effervescence produced on acidification when carbonates are present tends to carry off the volatile compounds. The acidified urine mixture is allowed to remain overnight in the cold to complete the oxidation before evaporation on a steam bath.

The samples may be obtained by allowing the subjects to urinate directly into 2½-liter glass-stoppered bottles. The danger of accidental contamination by dust and fumes at the plant makes collection there inadvisable. Thymol is used as the preservative.

Blanks on all reagents should be run from time to time in order to avoid contamination. Double quantities of all reagents used, when combined, should show no detectable quantities of selenium.

POSSIBLE SOURCES OF SELENIUM HAZARDS IN INDUSTRY

In table 3 are shown the industries that are manufacturing or processing selenium or selenium-bearing material. For convenience in discussion these industries have been divided into primary and secondary classes. The primary group includes those industries which extract, mine, treat, or process natural-occurring minerals which contain, in some cases, selenium in appreciable quantities. The secondary group includes those industries which utilize selenium and selenium compounds as basic materials in manufacturing processes.

The processes which on casual inspection may be expected to afford hazards to the worker are listed in table 3. The information presented is intended merely to designate potential hazards. Only by an environmental survey, with sampling of workroom atmosphere for selenium contamination, can there be any authentic evaluation of the occupational hazards inherent in any of the industries or processes listed. Methods for sampling workroom atmospheres have been developed (*5*, *6*) and are described below in detail. By suitable modifications of the technique, one is able to determine very minute amounts of selenium in nearly any form or combination.

TABLE 3.—*Industries and their possible selenium hazards*

Industry	Source of hazard	Type of hazard
Primary industries:		
1. Copper	Ore concentrate and flue dusts, sludges.	Se, SeO_2 and mixed dusts.
2. Lead and zinc	do	Do.
3. Pyrites roasting	Roasting towers, sludges	Mixed dusts, Se.
4. Lime and cement (certain areas).	Dust, kiln gases	Mixed dusts, SeO_2.
Secondary industries:		
1. Glass, ceramics	Melting pots and furnaces	Fumes of Se, SeO_2.
2. Rubber	Vulcanizing and curing processes	Organic vapors, H_2Se.
3. Steel and brass	Alloy furnaces	Dusts, Se, SeO_2. Fumes.
4. Paint and ink pigments	Pigment compounding and mixing	H_2Se, SeO_2, soluble dusts.
5. Plastics	Mixers, presses	Organic vapors.
6. Photoelectric	Melting and casting operations	Vapors, Se, SeO_2.
7. Chemicals	Mixing, melts, synthesis	Se, SeO_2, H_2Se, organic vapors.

Gas and vapors.—Vapors and gaseous constituents of plant atmosphere, and contaminations in laboratory workrooms, as well as those experimentally produced for animal exposure tests, may be sampled quantitatively by means of the apparatus outlined in figure 1.

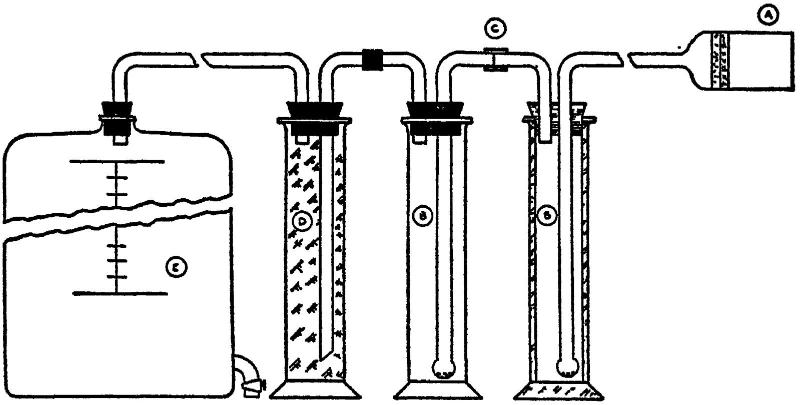

FIGURE 1.—Gas sampling apparatus. A, filter tube, 1½ by 3 inches sintered glass plate overlaid with asbestos; B, gas bubblers, 8 by 1½ inches, inside measurement, capacity 200 cc, rubber stoppered, contains 50 cc of 40 percent HBr, 10 percent bromine mixture; C, all connections glass to glass, rubber sleeved; D, vapor check tube, contains soda lime or charcoal, etc.; E, calibrated aspirating bottle, 10 or 20 liter capacity.

The sampling arrangement for absorbing gases or vapors consists first of a sintered glass plate, overlaid by a fine, dried, asbestos mat (A) which is designed to screen out all solid particles or droplets which might enter the bubblers. After passing this screen the air-gas mixture is bubbled successively through two bubblers (B), each containing a mixture of 40–48 percent hydrobromic acid, with free bromine 10 percent by weight. The oxidizing power of this solution is utilized to oxidize the selenium, whereby it can then be dissolved by the acid medium. After passing through the bubblers, the air stream moves into an absorption tube (D) containing some suitable material, in order to remove hydrogen bromide and bromine vapors. The suction or sampling bottle (E) contains water. As this water issues from the stopcock at the bottom of the bottle, air is drawn into the bottle through the bubbler chain. Since the volume of water displaced by the air is known, it is possible to determine the amount of selenium contained in this volume of air by analysis of the bubbler solutions.

The sampling bottle (E) consists of a 10- or 20-liter demijohn, calibrated to the required volume. A sample of 10 liters will prove sufficient in gas-air mixtures with selenium concentrations of more than 0.01 mg selenium per liter. For smaller amounts, 20 liters or more of the gas-air mixture must constitute the sample. The bubbler chain consists of two bubblers, each containing 50 cc of a mixture of 40 percent free bromine. The gas trap (D) may conveniently be another bubbler filled with loosely packed, coarse, granular soda lime, activated charcoal, or calcium hydroxide. This gas trap is necessary in order to absorb the vapors of bromine and hydrogen bromide carried over by the air stream. These vapors, if allowed to enter the sampling bottle, will give incorrect values since the volume of water drawn from the bottle is assumed to be a true measure of the volume of air sampled. Two bubblers have been found sufficient to entrap all the selenium in gas-air mixtures with concentrations ranging from 0.005 to 0.30 mg selenium per liter. In the development of the method, three bubblers were used at the higher concentrations. No selenium was found in the third bubbler but traces were often found in bubbler No. 2. The maximum rate of sampling used with uniform success was 2 liters per minute.

The sampling bottle should be of sufficient capacity so that water to the height of 5 to 8 inches remains in the bottle after 10 or 20 liters have been withdrawn. This layer of water is necessary in order to overcome the resistance in the bubbler train caused by the hydrostatic pressure of the hydrobromic acid in the bubblers. By controlling the rate of outflow of the water from the sampling bottle by means of the stopcock, it is possible to obtain a relatively constant sampling rate. With the decrease in the height of the water in the sampling bottle, the rate of sampling tends to decrease. Suitable manipulation will overcome this difficulty.

The asbestos pad, superimposed on the sintered glass filter, may be used in determining dust concentrations, as shown below. In gas-air determinations the asbestos pad may be used to filter out dust particles. As the amount of sample is rather small, no dust determinations have been made using these asbestos pads when sampling air-gas mixtures. If dust samples are required, simplified methods are available by which much larger samples may be obtained (*4*).

The contents of the bubblers may be combined and the selenium precipitated directly with sulfur dioxide or solid sodium sulfite. After the bromine is completely discharged, 1 or 2 grams of solid hydroxylamine hydrochloride are added. The mixture is then heated on a steam bath for one-half hour, and allowed to settle overnight. The resulting precipitate may be filtered on asbestos, redissolved with 40 percent hydrobromic acid containing 0.5 percent free bromine and reprecipitated as before, using filtered, saturated aqueous solutions of the reagents. If sufficient selenium is present, the second precipitate may be weighed on a tared Gooch crucible, after drying 1 hour at 105° C.

If the total amount of selenium in the combined hydrobromic acid bubbler solutions is less than 1 mg, it is recommended that the free bromine of the combined bubbler solutions be partially removed by treatment with solid sodium sulfite. Sufficient bromine should remain to impart a deep yellow color to the solution. This mixture is then distilled (*1*), the selenium precipitated from the distillate, filtered, redissolved, and estimated colorimetrically (*1*, *2*, *3*).

If the total amount of selenium in the bubbler solutions ranges between 1 and 5 mg, it may be made up to standard volume of 100 cc on dissolving the first precipitate with hydrobromic acid and bromine. A suitable aliquot may be taken and made up to 25 cc, the colorimetric estimation being carried out with this fraction. In practice the colorimetric estimation has been found to be most accurate when the amount of selenium is between 0.05 and 0.50 mg selenium per 25 cc of solution. The concentration of hydrogen bromide must be kept between 25 and 30 percent, since at this acid concentration the precipitate appears with readiness and in a form most easily matched in color. Hydrobromic acid of 25 to 30 percent concentration has been found to be most advantageous for the precipitation of selenium in this and similar analyses, utilizing the precipitation of selenium from hydrobromic acid solutions. As a rough approximation, when precipitating selenium from 48 percent hydrobromic acid solutions, add aqueous solutions of reagents or distilled water to increase the volume one-third.

In practice the above method for the absorption of gaseous selenium products has been found applicable to a variety of gases, namely, hydrogen selenide, selenium dioxide, ethyl selenide, methyl selenide, as well as various mixtures of unknown volatile selenium compounds produced on putrefaction of organic materials.

A soda lime tube has been used with great success in sampling atmosphere for hydrogen selenide content. The tube is of simple construction, being made from a 6-inch by ¾-inch pyrex test tube by sealing a glass tube in the closed end. At sampling rates of 4 liters per minute or less, these tubes, when charged with fresh, dry, soda lime, are satisfactory at all concentrations below 0.10 mg Se/liter. The selenium is recovered from the soda lime tube by distillation with hydrobromic acid (*1*). The selenium is precipitated and weighed or estimated colorimetrically.

Dusts.—For the study of dust concentrations in terms of numbers of particles per unit volume, methods are elsewhere presented (*11*) which have proved satisfactory. No discussion of these methods is necessary here since they apply to a variety of problems. The conditions of a particular study will determine the mode of sampling and the apparatus to be used. However, in studies of selenium dusts, if the total selenium content is to be found, only a limited number of methods present themselves.

The paper-thimble method of screening dusty atmosphere in order to obtain samples for chemical analysis (*11*) has proved satisfactory in a number of studies which involve many more technical difficulties than will be encountered in studies of selenium dust. The paper thimble and the cotton wool contained therein may be treated intact by the method of Williams and Byers for pyrites (*16*). Treatment in this manner will give excellent results and the total selenium content of the dusts will be determined, even though particles of the heavy metal selenides are present. Selenium of the order of 0.02 mg may be detected if reasonable care and proper technique are used (*1*, *2*).

In the study of certain dusts a method of air filtering, as shown in figure 1, will prove very satisfactory. This filter consists of a tube in which is sealed a sintered glass plate, approximately 1¼ inches in diameter. This porous plate is overlaid by a smooth, fine, dried asbestos mat. The mat may be easily washed off and reformed from prepared Gooch asbestos suspensions. By having the mat oven-dried (105° C. for 1 hour), very little resistance will be built up in the suction lines. Such a mat has been found to screen out the more commonly encountered dust as well as fog particles.

The filter, prepared as above, may be acid washed, dried at 105° C., and weighed. The dusty air may then be drawn through the filter, which is again dried and weighed. The weight of dust particles per unit volume of air may be calculated if the volume of air passing the filter is known.

The chemical composition of the dust, insofar as total selenium is present, may be arrived at by washing the asbestos pad into a beaker and treating as for pyrites (*16*). If the dust consists of elemental selenium, selenites, or selenates, 48 percent hydrobromic acid containing 1 percent free bromine may be drawn through the filter and the selenium distilled from the acid solution (*1*).

Either paper thimbles or asbestos pads are suitable for screening large samples. Types of samplers and methods of measuring air flow in use by the United States Public Health Service may be adapted to this type of work.

The filter arrangement of figure 1 will prove helpful in screening small samples of air-gas-dust mixtures. However, the slow rate of sampling required by this procedure may be insufficient to give adequate dust samples except where heavy concentrations are encountered. By treating the asbestos pad as suggested above and distilling the selenium with hydrobromic acid, amounts of selenium from 0.02 mg to 1.00 mg may be estimated colorimetrically (*1*, *2*).

TOXICOLOGICAL ASPECTS OF INDUSTRIAL HAZARDS DUE TO SELENIUM

Little is known of the toxic properties of selenium and its compounds insofar as this knowledge applies to industrial problems. Those processes which on casual inspection appear to present hazards have already been discussed (table 3). As has been previously stated, the purpose of this paper is to point out the possibility of the existence of such hazards in certain industries in order that those charged with hygienic control will be in a position to recognize the hazards and the possibilities of their elimination.

The extent of the hazard existing in industries where selenium is present is due primarily to the types of processes being carried out. Dusts, fumes, vapors, or liquids may result in definite hazards, the scope and degree of which are dependent upon the processes in progress and the protective devices used to dissipate the noxious materials. The dusts may be of such composition that on inhalation no soluble selenium compound is liberated. Soluble dusts, such as SeO_2, SeO_3, H_2SeO_3, H_2SeO_4, and certain halogen compounds may prove toxic because of the ease by which they are absorbed both by the lung tissue and from the alimentary tract. Selenium vapors may consist of certain of those soluble dusts listed, because of their relatively high vapor pressures at ordinary temperatures. However, the most noxious vapors may be expected to include organic compounds, i. e., methyl selenide, ethyl selenide, aromatic selenides, etc., as well as hydrogen selenide.

Absorption of organic selenium compounds through skin contact has not been studied experimentally. However, it has been shown that burns resulting from hot acids containing selenium as the bromide resulted in the appearance of selenium in the urine of the person so affected within 2 days (*4*).

The toxic effects of selenium compounds may differ with the mode of entry into the body. Inhalation of vapors will provide entry to the organism at the alveolar surfaces, as will entry of soluble dusts and dusts which are rendered soluble by phagocytic action. Ingestion of selenium-bearing material as a secondary result of inhalation may be occasioned by expulsion of such material from the respiratory tract. However, it must be stressed that cleanliness of habits and care at meal times are necessary to prevent ingestion of dirt from the hands. It is possible that absorption of organic liquids through the skin may provide an entry for the element, as on handling solvents or plasticizers, particularly at higher temperatures.

In determining the possibility of selenium poisoning, the occupational environment must be considered. If persons are exposed to selenium fumes or dusts, and show symptoms indicative of metallic poisoning, further confirmatory tests are evidently necessary in order to establish whether selenium is being absorbed. A thorough medical examination of the worker, accompanied by clinical laboratory studies, is suggested. An analysis of the 24- or 48-hour output of urine for selenium (*1*, *2*, *4*) is recommended as a confirmatory test. Normal human urine contains no detectable quantities of selenium. However, it must be pointed out that persons living in certain regions (*10*) show quantities of selenium in the urine due to consumption of locally grown foodstuffs which contain selenium. Local water supplies contaminated by selenium may account for its appearance in the urine of persons residing in certain areas (*14*).

The foregoing considerations have clearly shown that selenium presents potential hazards of such degree that further study is warranted. The adoption of control measures is suggested in order to protect workers from injurious effects as the result of absorption of seleniferous materials.

REFERENCES

(*1*) Robinson, W. O., Dudley, H. C., Williams, K. T., and Byers, H. G.: Determination of selenium and arsenic by distillation. J. Ind. Eng. Chem., Anal. Ed., 6: 274 (1934).

(*2*) Dudley, H. C., and Byers, H. G.: Determination of selenium in animal matter with a clinical test for urine. J. Ind. Eng. Chem., Anal. Ed., 7: 3 (1935).

(*3*) Dudley, H. C.: Toxicology of selenium. I. A study of the distribution of selenium in acute and chronic cases of selenium poisoning. Am. J. Hyg., 23: 169 (1936).

(*4*) Dudley, H. C.: Toxicology of selenium. II. The urinary excretion of selenium. Am. J. Hyg., 23: 181 (1936).

(*5*) Dudley, H. C.: Toxicology of selenium. III. Determination of selenium in air-gas-dust mixtures. Am. J. Hyg., 24: 227 (1936).

(*6*) Dudley, H. C., and Miller, J. W.: Toxicology of selenium. IV. Effects of exposure to hydrogen selenide. Pub. Health Rep., 52: 1217 (Sept. 3, 1937). (Reprint No. 1855.)

(*7*) Byers, H. G.: Selenium occurrence in certain soils in the United States with a discussion of related topics (see bibliography). U. S. Dept. of Agriculture Tech. Bull. No. 482 (1935). U. S. Dept. of Agriculture Tech. Bull. No. 530 (1936).

(*8*) Hamilton, A.: Industrial Poisons in the United States. Macmillan Company, New York, 1925.

(*9*) Hamilton, A.: Industrial Toxicology. Harpers Publishing Company, New York, 1934.

(*10*) Smith, M. I., Franke, K. W., and Westfall, B. B.: The selenium problem in relation to public health. Pub. Health Rep., 51: 1496 (Oct. 30, 1936). (Reprint No. 1780.)

(*11*) Bloomfield, J. J., and DallaValle, J. M.: The determination and control of industrial dusts. U. S. Public Health Service Bulletin No. 217. Government Printing Office, 1935.

(*12*) Strock, L., W.: Distribution of selenium in nature. Am. J. Pharm., **107**: 144 (1935).

(*13*) Rader, L. F., Jr., and Hill, W. D.: Occurrence of selenium in phosphates. J. Agri. Research, **51**: 1075 (1935).

(*14*) Williams, K. T., and Byers, H. G.: Occurrence of selenium in the Colorado River and some of its tributaries. Ind. Eng. Chem., News Ed., **13**: 353 (1935).

(*15*) Stenn, Frederick: "Alkali disease"—Selenium poisoning. A review. Arch. Path., **22**: 398 (September 1936).

(*16*) Williams, K. T., and Byers, H. G.: Occurrence of selenium in pyrites. J. Ind. Eng. Chem., Anal. Ed., **6**: 296 (1934).

ACUTE RESPONSE OF GUINEA PIGS TO INHALATION OF METHYL ISOBUTYL KETONE

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Methyl isobutyl ketone, commercially known as hexone, has been proposed as a diluent and denaturant of ethyl alcohol for external use, and is used industrially in making varnishes and lacquers, as are also methyl ethyl ketone (butanone) and methyl propyl ketone (pentanone). Of these ketones, the toxicity of the last two, with respect to inhalation, has been reported in the literature (*1*) in such a way as to give the limits of time and concentration of vapor which cause a series of symptoms and reactions graded in severity to the point where death is caused during the exposure. There has been, apparently, no such work on hexone. The toxicity of this compound as regards contact and ingestion will not be reported here.

PHYSICAL PROPERTIES

The first samples of commercial hexone used in these experiments contained about 5 percent of the alcohol used in its preparation, namely, secondary isobutyl carbinol, and some water. Subsequently a highly refined lot was obtained which tested as 99+ percent ketone and which was used in all the reported experiments. According to the chart prepared by the manufacturer, commercial hexone boils initially at 112° C. and finally at 118° C. The International Critical Tables give 119° C. as the boiling point of the pure product. Its molecular weight is 100.09, density 0.803, and refractive index 1.3949 at 20° C. It freezes at −84.7° C. The vapor tension of the commercial product, given by the manufacturer as 25 mm mercury at 30° C., is undoubtedly depressed by the presence of water vapor, since careful tests with pure hexone in the absence of water gave 40 mm Hg at 29.5° C. However, since under most circumstances there is water present, the lower value is the more practical one for calculating saturated vapor-air atmospheres.

ANALYSIS

The chemical analysis follows that used by Patty, Schrenk, and Yant.[1] Certain modifications were made, particularly in the method of adding the iodine solution to the sample. The results were calculated as milligrams per liter and converted to percent by volume on the basis that 1 gram molecular weight of hexone is equivalent to 24.45 liters of vapor at 25° C. and 760 mm pressure.

A Florence flask (1,000 ml) was used for the sampling and analysis. The flask, fitted with a one-hole rubber stopper and a glass stopcock, was calibrated with water. The dried flask was then charged with 50 ml NaOH (1 N) and connected to a vacuum pump and mercury gage. The sampling tube, which extends to the center of the exposure chamber, was flushed by withdrawing 1 liter of the air-vapor mixture.

The reading on the mercury gage was recorded, the stopcock closed, and the flask connected to the sampling tube. The volume of the air-vapor sample was calculated from the reading of the mercury gage and the observed barometric pressure, correction being made for the 50 ml occupied by the NaOH and the air contained in the upper section of the stopcock.

After collecting the sample, the flask was shaken to absorb the vapor in the NaOH solution. In order to avoid any loss of hexone vapor the flask was then cooled to reduce the pressure and an excess of 0.1 N iodine solution was drawn in through the stopcock which was rinsed several times with water. The contents of the flask were shaken vigorously and allowed to stand for 30 minutes at room temperature to allow the reaction to go to completion. The stopcock was opened to relieve the pressure, care being taken to avoid spattering. The stopcock, stopper, and flask were rinsed with water and 25 milliliters H_2SO_4 (2 N) were added to the contents. The concentrations of NaOH and H_2SO_4 were so adjusted that 50 ml NaOH was equivalent to 24.6 ml H_2SO_4. The excess iodine was titrated with 0.1 N sodium thiosulfate, using starch solution for the end point.

This method was standardized by analyses of a standard solution of hexone, a water solution containing 2 ml hexone per liter. When 25 ml of this solution (0.05 ml hexone) were used the average recovery in 12 determinations was 104.0 percent (103–105).

Cassar (*3*), in a report on methyl ethyl ketone, has shown that a recovery of 110.6 percent is obtained, due to a secondary reaction. The above recovery (104.0 percent) indicates that the commercial product which we used was 94 percent hexone, provided that a similar secondary reaction takes place to the same extent with this compound.

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[1] The analyses on commercial hexone were performed by W. H Reinhart, B. S., M S., who adapted the method given here in detail and which was used throughout the experiments. The analyses on pure hexone were performed by Peter J. Valaer, B. S.

The specific gravity of this sample was found to be 0.7974 at room temperature (25° C.). The Handbook of Chemistry and Physics (*2*) gives 0.8017, 20°/4° C., for methyl isobutyl ketone.

The excess of iodine varied considerably in the determinations. Cassar reported 15–35 percent excess as being satisfactory. The procedure was tested by varying excess of iodine, time, and temperature:

Excess of iodine		Recovery		
Expected (Cassar)	Actual	Range	Average	Expected (Cassar)
Percent	*Percent*	*Percent*	*Percent*	*Percent*
0.1	6–8	102.6–104.4	103.4	110.6
20	26–28	103.4–105.1	104.3	110.6
100	114	103.3–103.8	103.6	110.6

Time (for reaction—at room temperature)

1 minute = 102.0 percent recovery.
10 minutes = 104.2 percent recovery.
63 minutes = 104.4 percent recovery.

Sample kept cold (about 10° C.) during reaction

15 minutes = 103.7 percent recovery.
26 minutes = 104.3 percent recovery.

APPARATUS

The exposures were made in a glass-walled box of 1 cubic meter capacity connected serially by a centrifugal blower to a 1,000 cubic-foot chamber (fig. 1). The small chamber was fitted with fan and elevated pierced platform assuring equilibration of the gases in the chamber. Since an unlimited supply of the solvent was not at hand, a flowing atmosphere type of exposure was not feasible and static atmospheres had to be used. A large door sealed with sponge rubber was provided with armholes through which extended rubber gauntlets made of a section of inner tube and terminating in surgeon's gloves. A satisfactory temporary seal between gauntlet and glove was made by stretching both over a metal ring. An air lock between the chamber and the outside provided a means of introducing the animals or of removing them from the chamber at any time. Thus, concentrations of a desired magnitude could be built up at leisure and the animals introduced directly into this atmosphere. For exposures of short duration at high concentrations a saving of the material being tested was effected by using the small chamber alone. Analyses made of the oxygen content at various times during the exposures indicated that no perceptible diminution had taken

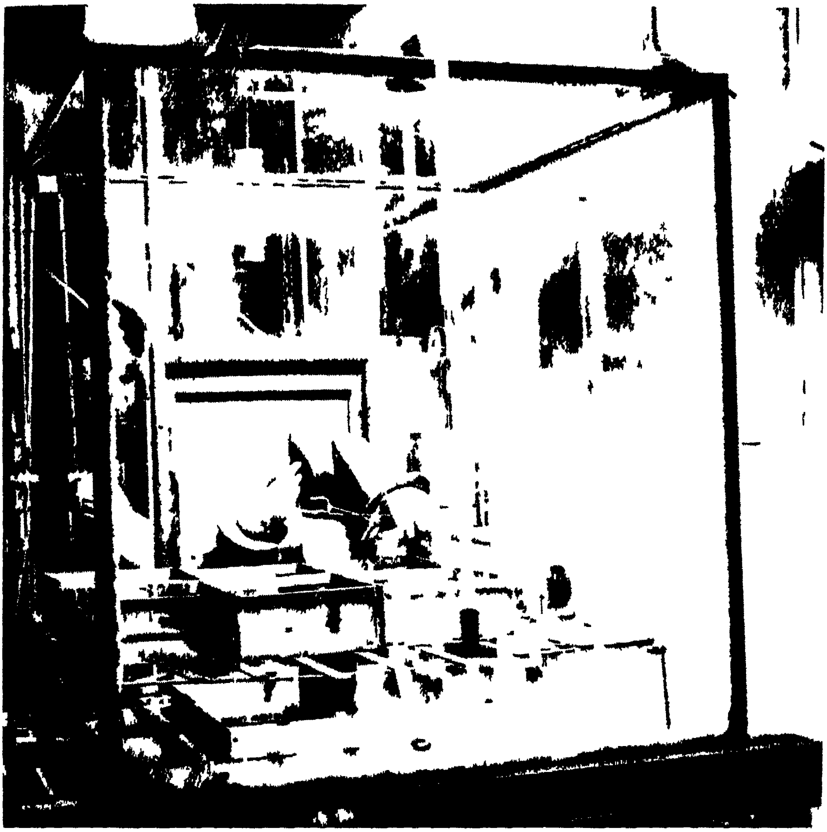


FIGURE 1 —One cubic meter exposure chamber showing door with gauntlets and air lock To the right is a small circulating fan In the foreground and at the top is the inlet from the large chamber, which can be seen in part at the right The sampling tube can be seen extending diagonally from upper left to the center of the chamber

place. It was assumed from this fact that carbon dioxide concentrations were not physiologically significant and support for this assumption was derived from respiratory data taken during a blank run with a maximum number of animals.

METHOD

Data were collected at each of five concentrations of hexone: 2.8 volume percent (saturation), 1.68 volume percent, 1.0 volume percent, 0.3 volume percent, and 0.1 volume percent, with particular regard to the following plan in which are arranged the responses or symptoms of guinea pigs in order of increasing severity of reaction:

1. Irritation of the cornea and conjunctiva (blinking of eyes, lacrimation, rubbing of eyes).
2. Irritation of buccal, nasal, and pharyngeal passages. (Sneezing, coughing, salivation, retching, rubbing of nose and mouth.)
3. Narcotization of central nervous system. (Postural instability, loss of auditory and corneal reflexes, change in respiratory rate and character, coma and death.)
4. Changes in metabolism of tissues (change in rectal temperature, change in pulse).

RESULTS

It is proposed to recapitulate here the protocol of an exposure at an average concentration of 1.68 volume percent hexone. A comparison with the effects at other concentrations follows in the discussion.

One hundred and twenty-five cubic centimeters of pure hexone were evaporated in the 1-cubic-meter chamber. The chamber temperature was 25.7° C., rising to 26.3° C. at the end of the exposure. Ten female guinea pigs of about 300 grams body weight were placed in the chamber through the air lock and a sample of the vapor air mixture withdrawn (1.81 volume percent). The normal rectal temperature taken immediately before exposure was 38.9° C. and the respiratory rate at rest was 117 beats per minute. A freshly killed pig was introduced to compare the rate of fall of temperature in the absence of normal metabolism.

Up to 1 minute.—Immediately upon introduction to the test atmosphere the pigs began to squint and rub their noses and eyes violently. Copious lacrimation occurred and sneezing and coughing was very frequent.

2 minutes.—Salivation was evident by the wet area about the mouth, neck, and brisket.

10 minutes.—All pigs were so weak that they could not remain erect; other symptoms in proportion.

15 minutes.—All pigs over on side making only feeble movements at most and usually quite inert. Corneal reflex still present. Pinnal flick in response to sharp click still present. (Auditory reflex.)

25 minutes.—Respiratory rate has dropped to 35 per minute, rectal temperature to 36.6° C.

40 minutes.—Pulse by palpation estimated at 240 beats per minute. Auditory and corneal reflexes gone. Respiration gasping and random pawing movements appear occasionally.

60 minutes.—Rectal temperature 34.7° C. Pulse 181 beats per minute. Concentration 1.70 volume percent.

85 minutes.—First death. Average temperature of survivors 33.4° C., pulse 143 beats per minute, respiratory rate 20 per minute.

94 minutes.—Second death.

108 minutes.—Third death.

125 minutes.—Fourth and fifth deaths. Average rectal temperature of survivors 32° C., pulse 155 beats per minute, respiratory rate 85 per minute.

131 minutes.—Sixth and seventh deaths.

134 minutes.—Eighth death.

142 minutes.—Ninth death. Concentration 1.53 volume percent.

204 minutes.—Chamber opened, one pig still gasping 100 breaths per minute, pulse 158 beats per minute, rectal temperature 30.4° C. Death occurred at least 2 hours after the end of the exposure.

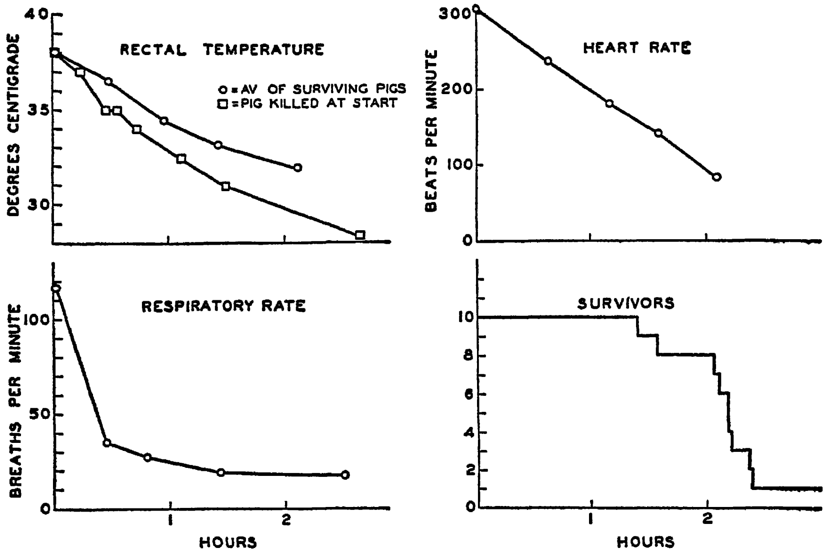


FIGURE 2.—Responses of guinea pigs to 1.68 volume percent (average) hexone vapor. All points are average values of survivors and therefore subject to vertical displacement due to the death of pigs with lower values. The survival chart will help in making interpretations.

DISCUSSION

The temperature of the dead pig introduced into the chamber fell off characteristically (fig. 2) and only a little faster than the average temperature of the anaesthetized pigs. This indicates that impairment of the metabolism was quite severe (*4*). The heart rate fell similarly from an estimated value of 300 to 85 beats per minute and it was observed that considerable irregularity in beat became manifest toward the end of the experiment. The respiratory rate fell off very abruptly from about 117 breaths per minute to 35 and less, which represents a spasmodic, gasping action.

The curves indicating the course of these data are presented in figure 2 with respect to survivors only. Therefore, some distortion of the final points occurs since a considerable variation normally exists and the pigs with high rates survive into the next period.

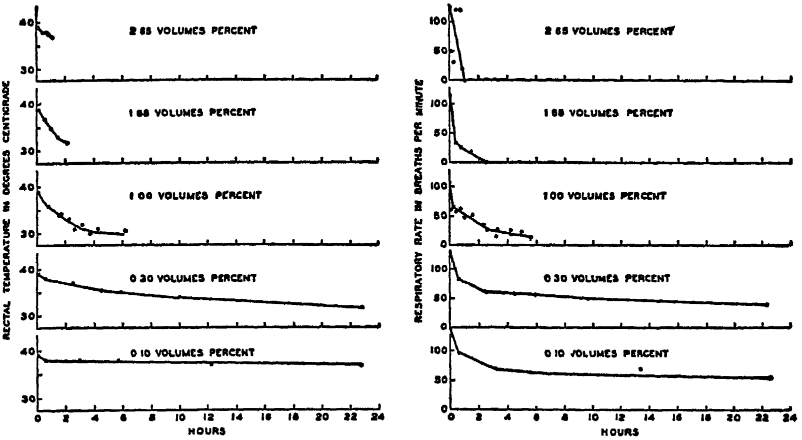
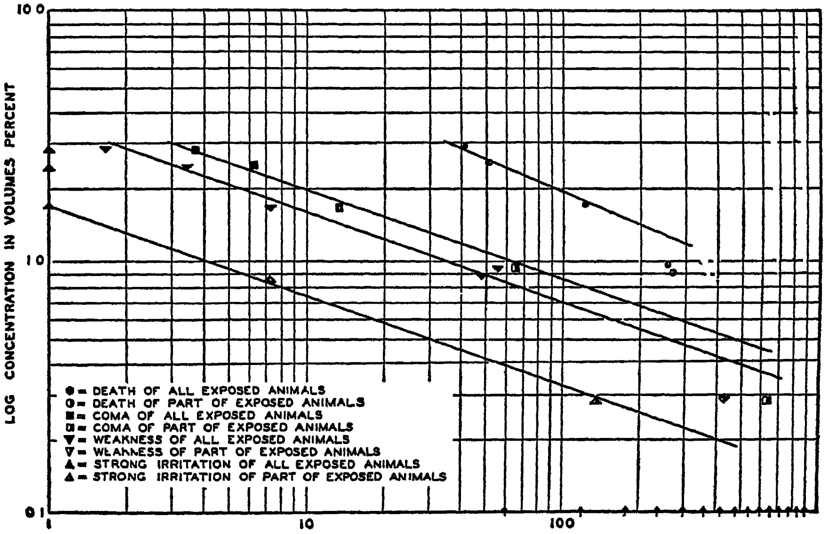


FIGURE 3—Response of rectal temperature and respiratory rate to inhalation of hexone at various concentrations



● = DEATH OF ALL EXPOSED ANIMALS
◐ = DEATH OF PART OF EXPOSED ANIMALS
■ = COMA OF ALL EXPOSED ANIMALS
◧ = COMA OF PART OF EXPOSED ANIMALS
▼ = WEAKNESS OF ALL EXPOSED ANIMALS
▽ = WEAKNESS OF PART OF EXPOSED ANIMALS
▲ = STRONG IRRITATION OF ALL EXPOSED ANIMALS
△ = STRONG IRRITATION OF PART OF EXPOSED ANIMALS

FIGURE 4—Relation of concentration of hexone vapor and time of exposure to various acute responses of guinea pigs. Average values are plotted throughout. The partially filled points represent incomplete reaction of all pigs in the exposed group.

It will be evident from a study of figure 3, showing rectal temperatures and respiratory rate, that there is a regular transition from highest to lowest concentration. This is true as well for all other data, as shown in figure 4.

In an atmosphere saturated at room temperature, about 25° C., hexone is present at about 3.0 to 2.5 volumes percent depending on the presence of water. In such an atmosphere the time course of the events listed above is considerably shortened so that the average time of death is 45 minutes, and few animals survive over 60 minutes (see fig. 4). The symptoms are the same, but the course of temperature fall is so short that the animals die before a great deal of heat is lost (see fig. 3). The decrease in respiratory rate is much more rapid than at lower concentrations and in many cases the change from the repressed type of breathing, due to irritation, to the gasping, due, presumably, to asphyxiation is extremely abrupt. A graphical representation of temperature and respiratory rate for each of five concentrations is given in figure 3.

In the lowest concentration used, approximately 0.1 volume percent, the vapor was still exceedingly irritating to the eyes and nose of the operator, yet the pigs showed little inconvenience and only slight effect on the maintenance of usual stance, reflexes, and temperature. It is obvious from figure 3 that the respiratory rate fell in the first 6 hours of exposure to a level suggesting a low grade narcosis. This is in accord with the general aspect of the animals; they were very quiet and sat hunched up. During the night between observations some climbed out of their cages, seeking the warmth of the other pigs. The taking of rectal temperatures became less and less troublesome, due to the evident relaxation of the anal sphincter. The temperature, as indicated above, was maintained very well in view of our experience with normal animals in which variations of several degrees are to be expected with changes in environmental temperature (see also (*5*), p. 154).

Animals which succumbed to exposures were autopsied and microscopic investigations were made in several cases to ascertain any marked effects. Gross changes were slight and mainly in the direction of congestion, especially in the brain and lungs. Microscopical study[2] indicated a fine droplet fatty metamorphosis in many liver cells, but most cells were normal and many sections of the liver showed no pathology at all. The kidneys and heart showed no abnormalities, but the spleen showed some congestion and hypertrophy. The brain and lungs showed no changes other than a slight congestion.

Survivors of the exposure have not indicated any gross pathology other than that found in the controls, and the deaths are attributable to a pulmonary affection common to laboratory animals. It is probable that the low body temperatures attained in the longer exposures are in themselves a predisposing factor to the development of a lung infection.

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[2] Microscopical study was made by Acting Assistant Surgeon J. W. Miller.

Since we are concerned mainly with acute effects, no investigation of latent or chronic effects was planned, but the survivors of the exposure were observed for several months and autopsies performed on the pigs that died subsequently. No significant results have appeared in relation to the exposures.

In comparison with acetone it is evident that hexone has the common property of narcosis. Most authors agree that the ketones are only slightly toxic in acute exposures and that their effects are due mainly to the degree of narcosis which develops (*6*, *7*).

SUMMARY AND CONCLUSIONS

Methyl isobutyl ketone vapor inhalation causes irritation of conjunctival and nasal mucosa in man at concentrations below 0.1 volume percent, although this concentration is well tolerated by guinea pigs. This indicates good warning qualities. At higher concentrations marked irritation is exhibited by guinea pigs as evidenced by lacrimation and salivation. A progressive narcosis occurs, causing lowering of body temperature, respiratory rate, and heart rate. A loss of static control, consciousness, and the deeper reflexes follows. Death finally ensues at 1.0 volume percent in about 4 hours and in progressively shorter periods at higher concentrations. Complete recovery can be effected by removal at any but the terminal stages. Gross and microscopic pathology is slight and resembles that of most acute reactions to solvent exposures.

ACKNOWLEDGMENTS

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REFERENCES

(*1*) Acute response of guinea pigs to vapors of some new commercial organic compounds:

I. Ethylene dichloride. Sayers, R. R., Yant, W. P., Waite, C. P., and Patty, F. A.: Pub. Health Rep., **45**: 225–239 (Jan. 31, 1930). (Reprint No. 1349.)

II. Ethyl benzene. Yant, W. P., Schrenk, H. H., Waite, C. P., and Patty, F. A.: Pub. Health Rep., **45**: 1241–1250 (May 30, 1930). (Reprint No. 1379.)

III. Cellosolve. Waite, C. P., Patty, F. A., and Yant, W. P.: Pub. Health Rep., **45**: 1459–1466 (June 27, 1930). (Reprint No. 1389.)

IV. Ethylene oxide. Waite, C. P., Patty, F. A., and Yant, W. P.: Pub. Health Rep., **45**: 1832–1843 (Aug. 8, 1930). (Reprint No. 1401.)

V. Vinyl chloride. Patty, F. A., Yant, W. P., and Waite, C. P.: Pub. Health Rep., 45: 1963–1971 (Aug. 22, 1930). (Reprint No. 1405.)

VI. Dioxan. Yant, W. P., Schrenk, H. H., Waite, C. P., and Patty, F. A.: Pub. Health Rep., 45: 2023–2032 (Aug. 29, 1930). (Reprint No. 1407.)

VII. Dichloroethyl ether. Schrenk, H. H., Patty, F. A., and Yant, W. P.: Pub. Health Rep., 48: 1389–1398 (Nov. 17, 1933). (Reprint No. 1602.)

VIII. Butanone. Patty, F. A., Schrenk, H. H., and Yant, W. P.: Pub. Health Rep., 50: 1217–1228 (Sept. 6, 1935). (Reprint No. 1702.)

IX. Pentanone. Yant, W. P., Patty, F. A., and Schrenk, H. H.: Pub. Health Rep., 51: 392–399 (Apr. 3, 1936). (Reprint No. 1739.)

X. Hexanone. Schrenk, H. H., Yant, W. P., and Patty, F. A.: Pub. Health Rep., 51: 624–631 (May 15, 1936). (Reprint No. 1747.)

XI. Secondary amyl acetate. Patty, F. A., Yant, W. P., and Schrenk, H. H.: Pub. Health Rep., 51: 811–819 (June 19, 1936). (Reprint No. 1756.)

XII. Normal butyl acetate. Sayers, R. R., Schrenk, H. H., and Patty, F. A.: Pub. Health Rep., 51: 1229–1236 (Sept. 4, 1936). (Reprint No. 1769.)

XIII. Methyl formate. Schrenk, H. H., Yant, W. P., Chornyak, John, and Patty, F. A.: Pub. Health Rep., 51: 1329–1337 (Sept. 25, 1936). (Reprint No. 1773.)

(2) Handbook of Chemistry and Physics. 20th ed. Chemical Rubber Publishing Co. 1935.

(3) Cassar, H. A.: Determination of isopropyl alcohol in presence of acetone, and of methyl ethyl ketone in presence of secondary butyl alcohol. Ind. and Eng. Chem., 19: 1061–1062 (1927).

(4) Gellhorn, E.: Oxygen deficiency, carbon dioxide, and temperature regulation. Am. J. Physiol., 120: 190–194 (1937).

(5) Hawkins, J. A.: Acid-base equilibrium of blood of guinea pigs, rabbits, and rats. J. Biol. Chem., 61: 147–155 (August 1924).

(6) Flury, F., and Zernick, F.: Schadliche Gase. Page 392. Berlin, 1931.

(7) Durrans, T. H.: Solvents. Page 53. D. Van Nostrand Co., 1930.

A NOTE ON THE QUALITY OF DRINKING WATER ON TRAINS

By Arthur P. Miller, *Sanitary Engineer*, and Edmund C. Garthe, *Junior Sanitary Engineer, U. S. Public Health Service*

From September 14, 1936, to February 15, 1937, 1,090 samples of drinking water were collected from coolers and other containers on trains operating in interstate traffic by trained collectors under the supervision of Interstate Sanitary District No. 1 at two large terminals in New York City and three smaller ones in Hoboken and Jersey City, N. J.

The purpose of this work was to determine, in a relative way, whether the sanitary measures in vogue and the protective devices employed in the terminals were effective in protecting the quality of the water during its passage from the mains of the municipality supplying it to the hands of the consumers on the trains. It was assumed that if a carrier did not adequately care for and protect its car-watering facilities against contamination, or if it failed thoroughly to cleanse the storage facilities on the cars at sufficient intervals, those facts would be reflected in the quality of the water as secured from the coolers and other containers. However, it was felt that this assumption could be confirmed in a sound fashion only if enough samples were secured so that idiosyncrasies in sampling would be of insignificant weight in the drawing of the conclusions.

Samples were taken from all types of cars without any attempt to be selective. In the same way, there was no choice made of trains; but all trains which could be conveniently reached during working hours on the days samples were collected were entered regardless of whether they were preparing to leave the terminal, were entering it as a final destination, or were passing through to other points. No effort was made to secure absolute information regarding the source or sources of the water in a container at the time of sampling, as such information would have been indefinite and would have been of no use in assisting to formulate the conclusions sought.

All the samples were tested in a laboratory under the supervision of this station by personnel trained so that their methods and technique would be comparable. The Standard Methods of Water Analysis of the American Public Health Association (8th edition, 1936) was followed in the laboratory work, and all tests were carried through the completed stage. Five 10-cc portions of each sample were planted.

Because the samples taken in no way came from a single source of supply, the Treasury Department Standards for Drinking Water could not be applied to the results. It was possible, therefore, only to evaluate the results secured on each railroad's series of samples by comparing them with those that would be obtained on samples of water free of contamination and with the results of the tests on each other railroad's series. Only in this way could an opinion be drawn as to the quality of the work done by one railroad as against that of another. It was further decided that any samples showing 3 or more 10-cc tubes positive for the *coli-aerogenes* group would be considered as unsatisfactory. Along with the determination of organisms of this group the total bacteria per ml growing on agar at 37° C. was obtained. It was thought that these might be useful for comparing with the trends of the *coli-aerogenes* determinations and as a measure of cleanliness. At no time did more than 2 hours elapse between the collection and testing of a sample.

An attempt was made to correlate the results with the type of car from which the samples were taken, but this was not fruitful of results. It is interesting to note, however, that one of the lines from which a large number of samples was secured was, with its more intimate knowledge of the cars sampled, able to show a correlation between unfavorable results and one particular car design.

The following table gives all of the results tabulated in the fashion found to be most useful to the authors:

Railroad	Number of samples collected	Percentages of samples showing 3 or more 10-cc tubes positive for coli-aerogenes	Percentages of samples examined resulting in total bacteria per ml on agar at 37° C. of—		
			100 to 999	1,000 and over	100 and over
1	190	12.1	28.6	37.8	66.4
2	206	2.0	35.0	15.4	50.3
3	157	15.9	27.8	37.1	64.9
4	28	7.1	22.2	14.8	37.0
5	150	.7	16.1	8.7	24.8
6	78	1.3	24.3	11.5	35.9
7	26	0	23.1	30.8	53.8
8	30	3.3	13.3	56.6	70.0
9	135	3.0	18.5	20.7	39.3
Total and average	1,090	5.8	26.1	23.3	49.4

It will be noted that the percentages of samples showing 3 or more 10-cc tubes positive for coli-aerogenes for railroads 1 and 3 are considerably higher than for all others except 4, and that the percentages of all three of these roads are in excess of the average for all samples tested, two of them considerably so. The total numbers of bacteria per ml were so inconsistent among themselves and as related to the coli-aerogenes determinations that they were not used in arriving at conclusions.

It is known that the sources of water supplying these lines are satisfactory, and that if the water is safely handled it should reach the consumers in good condition. Therefore, these results indicate that at least two of the railroads are inefficiently cleaning the containers on their cars or are handling the water after it leaves the supplying municipality's system in such a careless and insanitary fashion as to permit contamination.

When it is possible to secure a large number of samples from the cars of one railroad, it is believed that this scheme has merit in determining roughly which railroads are giving sufficient attention to railroad and terminal sanitation and which are not. In this way, this kind of work is helpful as an adjunct to field investigations of sanitary measures in vogue at railroad terminals or watering points.

SUMMARY

Bacteriological tests made on 1,090 samples of drinking water collected from containers on all types of cars operated by 9 different railroads having terminals in or adjacent to New York City indicated that at least 2 of these railroads were inefficiently cleaning their storage containers or contaminating the water by handling it in a careless and insanitary fashion during the process of transferring it from the sources of supply to the containers.

DEATHS DURING WEEK ENDED FEBRUARY 5, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Feb. 5, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	9,049	[1] 10,319
Average for 3 prior years	9,788	----------
Total deaths, first 5 weeks of year	45,719	54,488
Deaths under 1 year of age	538	[1] 636
Average for 3 prior years	610	----------
Deaths under 1 year of age, first 5 weeks of year	2,697	3,247
Data from industrial insurance companies:		
Policies in force	69,801,473	69,123,600
Number of death claims	13,870	15,233
Death claims per 1,000 policies in force, annual rate	10.4	11.5
Death claims per 1,000 policies, first 5 weeks of year, annual rate	10.1	11.7

[1] Data for 85 cities.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (------) indicate that cases or deaths may have occurred, although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 12, 1938, and Feb. 13, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937
New England States:								
Maine	1	4	11	499	155	28	0	0
New Hampshire	------	------	4	57	91	44	0	0
Vermont	------	------	------	------	300	1	0	1
Massachusetts	2	6	------	------	204	1,006	2	3
Rhode Island	------	1	------	------	2	179	2	0
Connecticut	4	1	4	438	16	340	0	0
Middle Atlantic States:								
New York	30	34	[1] 18	[1] 50	673	288	4	12
New Jersey [2]	19	13	7	54	1,000	464	1	3
Pennsylvania	64	44	------	------	6,866	145	7	14
East North Central States:								
Ohio	35	20	------	1,298	1,808	21	3	3
Indiana	43	5	12	172	516	4	5	4
Illinois	32	30	24	239	4,848	37	4	12
Michigan [3]	26	13	2	24	1,902	58	1	4
Wisconsin	3	1	28	632	2,180	22	0	4
West North Central States:								
Minnesota	2	1	4	14	9	20	1	1
Iowa	11	6	8	90	55	2	2	1
Missouri	22	10	162	1,573	848	4	1	3
North Dakota	1	1	6	207	15	------	1	6
South Dakota	------	------	------	29	------	1	0	1
Nebraska	5	4	------	7	12	21	0	0
Kansas	12	5	24	698	417	6	1	2
South Atlantic States:								
Delaware	------	1	------	6	24	102	0	1
Maryland [2]	17	12	20	394	35	385	2	6
District of Columbia	10	6	1	58	11	32	1	0
Virginia	24	16	------	------	633	163	10	10
West Virginia	7	20	46	1,510	323	8	3	4
North Carolina [3]	27	24	38	115	1,662	61	8	4
South Carolina [3]	2	8	645	1,135	375	32	1	0
Georgia [3]	11	12	------	827	327	------	1	1
Florida [3]	12	5	------	5	409	4	2	10
East South Central States:								
Kentucky	12	6	38	376	450	36	6	6
Tennessee	18	16	168	837	824	182	1	5
Alabama [3]	13	8	331	920	846	8	9	4
Mississippi [2]	8	4	------	------	------	------	1	1
West South Central States:								
Arkansas	10	5	235	1,048	302	------	3	15
Louisiana	5	7	44	228	------	1	1	0
Oklahoma [4]	18	4	284	1,342	60	15	1	3
Texas [2]	80	51	940	8,624	167	330	[illegible]	9

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 12, 1938, and Feb. 13, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb 12, 1938	Week ended Feb 13, 1937	Week ended Feb 12, 1938	Week ended Feb 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937
Mountain States:								
Montana		7		403	5	7	1	2
Idaho	1		5	134	5	88	0	0
Wyoming	1				13		0	0
Colorado	11	1			554		0	0
New Mexico	7		1	406	76	29	0	0
Arizona	7	3	168	969	3	156	1	3
Utah [2]		1			81	24	0	0
Pacific States:								
Washington	4	2	4	11	22	61	0	3
Oregon	2	1	76	770	17	8	1	0
California	27	25	111	6,087	185	89	1	17
Total	646	450	3,469	27,281	29,326	4,512	89	178
First 6 weeks of year	4,055	3,574	18,420	168,977	132,262	26,282	552	883

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938
New England States:									
Maine	0	0	11	25	0	0	0	1	61
New Hampshire	0	0	7	13	0	0	0	0	6
Vermont	0	0	21	16	0	0	0	0	21
Massachusetts	0	1	308	235	0	0	1	0	158
Rhode Island	0	0	31	63	0	0	1	0	25
Connecticut	0	0	97	97	0	0	0	1	48
Middle Atlantic States:									
New York	0	1	690	746	0	5	2	5	385
New Jersey [3]	0	0	115	164	0	0	1	4	158
Pennsylvania	0	0	472	834	0	0	4	8	261
East North Central States:									
Ohio	0	1	472	313	67	1	1	3	120
Indiana	0	0	188	160	42	2	0	0	16
Illinois	1	0	805	622	41	11	1	3	105
Michigan [3]	1	1	497	733	6	8	19	1	208
Wisconsin	0	0	206	361	4	2	1	0	152
West North Central States:									
Minnesota	0	0	150	136	26	8	0	0	45
Iowa	0	1	251	291	41	33	1	1	17
Missouri	0	0	202	288	27	98	3	2	90
North Dakota	0	0		73	11	57	0	1	15
South Dakota	0	1	23	69	9	6	2	0	25
Nebraska	0	0	53	108	5	5	0	1	7
Kansas	0	1	267	314	32	45	1	0	105
South Atlantic States:									
Delaware	0	0	16	2	0	0	0	0	7
Maryland [3]	0	0	83	49	0	0	0	0	71
District of Columbia	0	0	15	17	0	0	0	0	12
Virginia	0	0	56	31	1	1	1	4	78
West Virginia	0	0	50	49	0	0	5	1	62
North Carolina [3]	0	1	50	57	2	0	3	2	385
South Carolina [3]	0	0	2	6	0	0	5	2	61
Georgia [3]	2	0	14	12	0	0	5	3	72
Florida [3]	0	3	10	7	0	0	0	2	6
East South Central States:									
Kentucky	4	1	68	24	35	0	0	3	64
Tennessee	0	1	54	27	10	0	3	6	74
Alabama [3]	0	1	22	16	1	5	3	1	16
Mississippi [3]	5	1	8	8	2	0	0	9	

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 12, 1938, and Feb. 13, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938	Week ended Feb. 13, 1937	Week ended Feb. 12, 1938
West South Central States:									
Arkansas	0	3	15	17	10	1	6	1	54
Louisiana	0	0	14	10	0	0	12	5	19
Oklahoma [4]	0	1	47	27	27	1	2	3	39
Texas [3]	1	1	169	109	25	5	20	3	261
Mountain States:									
Montana	1	0	34	54	12	23	0	1	16
Idaho	0	0	17	0	28	3	2	0	8
Wyoming	0	0	18	12	9	4	0	0	19
Colorado	0	0	80	42	5	0	1	0	12
New Mexico	0	0	38	25	0	0	6	3	37
Arizona	0	0	22	28	0	0	0	0	45
Utah [2]	0	0	66	16	6	0	0	0	46
Pacific States:									
Washington	0	0	61	62	48	16	0	1	167
Oregon	1	0	80	20	30	11	1	2	28
California	2	0	171	274	37	25	6	4	271
Total	18	20	6,146	6,662	599	371	117	87	3,958
First 6 weeks of year	124	141	35,937	36,535	3,618	1,828	707	698	23,904

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[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Feb. 12, 1938, 25 cases, as follows: North Carolina, 1; South Carolina, 1; Georgia, 7; Florida, 4; Alabama, 2; Texas, 10.
[4] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
December 1937										
Alaska	------	------	7	------	1	------	0	------	0	0
January 1938										
Arkansas	3	68	682	49	630	6	4	52	55	8
District of Columbia	3	37	12	------	49	------	0	83	0	4
Florida	15	74	27	13	479	4	2	41	7	13
Georgia	6	63	956	345	1,234	50	2	78	4	10
Tennessee	20	82	863	15	1,962	11	5	188	20	15
Wyoming	------	4	------	------	16	------	0	67	15	0

	Cases
December 1937	
Alaska:	
Chickenpox	48
Impetigo contagiosa	2
Mumps	136
Whooping cough	9
January 1938	
Anthrax:	
Arkansas	2
Chickenpox:	
Arkansas	102
District of Columbia	285
Florida	159
Georgia	294
January 1938—Continued	
Chickenpox—Continued.	
Tennessee	369
Wyoming	112
Conjunctivitis, infectious:	
Georgia	7
Dengue:	
Florida	2
Dysentery:	
Arkansas (amoebic)	1
Arkansas (bacillary)	4
District of Columbia (amoebic)	1
Florida (amoebic)	2
Georgia (amoebic)	6
Georgia (bacillary)	4
January 1938—Continued	
Dysentery—Continued.	
Tennessee (amoebic)	2
Tennessee (bacillary)	3
Encephalitis, epidemic or lethargic:	
District of Columbia	2
Tennessee	1
German measles:	
Arkansas	5
Tennessee	10
Hookworm disease:	
Arkansas	1
Florida	380
Georgia	1,596
Tennessee	1

Summary of monthly reports from States—Continued

January 1938—Continued	Cases
Impetigo contagiosa:	
Tennessee	4
Mumps:	
Arkansas	26
Florida	56
Georgia	347
Tennessee	212
Wyoming	67
Paratyphoid fever:	
Georgia	1
Puerperal septicemia:	
Georgia	4
Tennessee	5
Rabies in animals:	
Arkansas	23
Florida	4

January 1938—Continued	Cases
Rabies in man:	
Georgia	1
Septic sore throat:	
Arkansas	3
Georgia	40
Tennessee	71
Tetanus:	
Florida	4
Georgia	1
Trachoma:	
Arkansas	7
Tularaemia:	
Arkansas	6
Florida	1
Georgia	5
Tennessee	9

January 1938—Continued	Cases
Typhus fever:	
Florida	2
Georgia	43
Tennessee	1
Undulant fever:	
Georgia	3
Tennessee	1
Vincent's infection:	
Florida	22
Tennessee	6
Whooping cough:	
Arkansas	176
District of Columbia	35
Florida	54
Georgia	152
Tennessee	151
Wyoming	49

CASES OF VENEREAL DISEASES REPORTED FOR DECEMBER 1937

These reports are published monthly for the information of health officers in order to furnish current data as to the prevalence of the venereal diseases. The figures are taken from reports received from State and city health officers. They are preliminary and are therefore subject to correction. It is hoped that the publication of these reports will stimulate more complete reporting of these diseases.

Reports from States

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Alabama	1,407	4.86	810	1.07
Arizona [1]				
Arkansas	466	2.28	215	1.05
California	2,115	3.44	1,812	2.94
Colorado	45	.42	25	.23
Connecticut	225	1.29	127	.73
Delaware	238	9.11	57	2.18
District of Columbia	196	3.13	140	2.23
Florida	2,065	12.36	246	1.47
Georgia	1,007	3.26	937	3.04
Idaho	39	.79	37	.75
Illinois	1,650	2.09	1,037	1.81
Indiana	266	.77	66	1.89
Iowa [2]	307	1.20	183	.72
Kansas	233	1.25	82	.44
Kentucky	770	2.64	413	1.41
Louisiana	217	1.02	81	.38
Maine	56	.65	48	.56
Maryland	1,084	6.45	367	2.19
Massachusetts	475	1.07	495	1.12
Michigan	951	1.97	650	1.34
Minnesota	271	1.02	238	.90
Mississippi	1,499	7.41	2,162	10.68
Missouri	473	1.21	108	.27
Montana [2]	56	1.04	30	.55
Nebraska	70	.51	88	.65
Nevada [3]				
New Hampshire	18	.35	12	.24
New Jersey	867	2.00	350	.81
New Mexico	241	5.71	71	1.68
New York [2]	620	.48	720	.60
North Carolina	2,166	6.20	473	1.35
North Dakota [1]				
Ohio	1,448	2.15	457	.68
Oklahoma	403	1.58	382	1.50
Oregon	95	.93	196	1.91
Pennsylvania	1,998	2.00	214	.20
Rhode Island	117	1.71	53	.78
South Carolina [1]				
South Dakota	27	.40	14	.20
Tennessee	811	2.80	387	1.34
Texas	252	.41	162	.26
Utah	1	.02	9	.17
Vermont	17	.44	30	.78
Virginia	836	3.09	239	.98

See footnotes at end of table.

Reports from States—Continued

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Washington	501	3.02	380	2.29
West Virginia [3]	260	1.40	134	.72
Wisconsin [4]	81	.28	176	.60
Wyoming [5]	20	.85	14	.60
Total	26,960	2.14	14,427	1.14

Reports from cities of 200,000 population or over

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Akron, Ohio [1]	----------	----------	----------	----------
Atlanta, Ga	244	8.49	180	6.26
Baltimore, Md	703	8.52	261	3.16
Birmingham, Ala	198	7.01	69	2.44
Boston, Mass	212	2.68	143	1.80
Buffalo, N. Y	218	3.68	74	1.25
Chicago, Ill	845	2.36	633	1.77
Cincinnati, Ohio [1]	----------	----------	----------	----------
Cleveland, Ohio	237	3.08	104	1.11
Columbus, Ohio	111	3.63	24	.79
Dallas, Tex	196	6.76	111	3.83
Dayton, Ohio	59	2.81	11	.52
Denver, Colo.[1]	----------	----------	----------	----------
Detroit, Mich	384	2.22	315	1.82
Houston, Tex.[6]	181	5.40	35	1.05
Indianapolis, Ind.[1]	----------	----------	----------	----------
Jersey City, N. J.[1]	----------	----------	----------	----------
Kansas City, Mo	25	.59	1	.02
Los Angeles, Calif	872	6.09	521	3.64
Louisville, Ky	413	12.75	123	3.79
Memphis, Tenn	158	5.92	74	2.77
Milwaukee, Wis.[1]	----------	----------	----------	----------
Minneapolis, Minn.[1]	----------	----------	----------	----------
Newark, N. J	278	6.00	113	2.43
New Orleans, La	77	1.61	46	.96
New York, N. Y.[1]	----------	----------	----------	----------
Oakland, Calif	62	2.04	72	2.37
Omaha, Nebr	23	1.04	12	.54
Philadelphia, Pa	611	3.07	----------	----------
Pittsburgh, Pa	284	4.15	21	.31
Portland, Oreg	82	2.61	114	3.63
Providence, R. I	62	2.39	28	1.08
Rochester, N. Y	35	1.04	47	1.39
St. Louis, Mo	324	3.87	146	1.74
St. Paul, Minn.[1]	----------	----------	----------	----------
San Antonio, Tex.[1]	----------	----------	----------	----------
San Francisco, Calif	141	2.10	247	3.68
Seattle, Wash	211	5.56	171	4.50
Syracuse, N. Y	83	3.81	63	2.89
Toledo, Ohio	107	3.51	29	.95
Washington, D. C.[7]	196	3.13	140	2.23

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[1] No report for current month.
[3] Incomplete.
[2] Not reporting.
[4] Only cases of syphilis in the infectious stage are reported.
[5] From report submitted to Medical Director of Epidemiological Studies.
[6] Reported by Jefferson Davis Hospital.
[7] Reported by Social Hygiene Clinic.

WEEKLY REPORTS FROM CITIES

City reports for week ended Feb. 5, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	223	1,492	182	3,348	1,009	2,024	27	408	20	1,168	--------
Current week [1]	171	232	83	7,912	818	1,609	60	351	17	916	--------
Maine:											
Portland	0	------	1	5	1	5	0	4	0	14	31
New Hampshire:											
Concord	0	------	0	4	1	0	0	1	0	4	10
Manchester	0	------	0	0	0	1	0	0	0	0	5
Nashua	0	------	0	0	3	0	0	0	0	0	10
Vermont:											
Barre	------	------	------	------	------	------	------	------	------	------	------
Burlington	0	------	0	9	0	1	0	0	0	6	12
Rutland	0	------	0	0	0	0	0	0	0	0	5
Massachusetts:											
Boston	0	------	0	116	21	79	0	9	1	23	225
Fall River	2	------	0	0	2	0	0	0	0	11	32
Springfield	0	------	0	0	4	3	0	0	0	3	36
Worcester	0	------	0	0	10	9	0	2	0	6	60
Rhode Island:											
Pawtucket	0	------	0	0	2	3	0	0	0	1	18
Providence	0	------	0	2	12	16	0	3	0	14	78
Connecticut:											
Bridgeport	0	2	1	0	1	15	0	1	0	1	39
Hartford	0	1	0	0	2	19	0	1	0	0	49
New Haven	0	------	0	1	3	6	0	0	0	6	49
New York:											
Buffalo	0	------	0	4	18	27	0	7	0	14	174
New York	32	16	3	221	137	282	0	78	4	170	1,549
Rochester	0	1	0	1	10	5	0	1	0	9	66
Syracuse	0	------	0	9	7	17	0	0	0	11	44
New Jersey:											
Camden	0	------	0	65	3	2	0	2	0	0	29
Newark	0	1	0	6	15	12	0	9	0	11	111
Trenton	0	------	0	32	1	6	0	2	0	2	28
Pennsylvania:											
Philadelphia	4	12	4	403	31	103	0	13	1	51	509
Pittsburgh	3	6	5	399	29	40	0	8	0	19	200
Reading	0	------	0	3	0	2	0	0	0	1	26
Scranton	2	------	--------	50	-------	2	0	-------	0	2	--------
Ohio:											
Cincinnati	2	3	2	0	12	7	7	10	0	3	157
Cleveland	2	12	2	114	14	57	0	12	0	37	194
Columbus	1	1	1	160	8	9	0	3	0	2	96
Toledo	2	1	1	128	4	5	1	4	0	9	63
Indiana:											
Anderson	0	------	0	2	3	2	10	0	0	0	10
Fort Wayne	1	------	0	17	3	14	0	0	0	0	29
Indianapolis	27	------	2	44	12	11	0	5	0	4	110
South Bend	1	------	0	0	5	2	1	0	0	0	21
Terre Haute	3	------	0	12	0	0	1	0	0	0	19
Illinois:											
Alton	0	------	0	0	1	3	0	0	0	0	10
Chicago	17	17	3	1,951	77	247	0	35	0	40	779
Elgin	2	------	1	1	3	13	0	0	0	1	18
Moline	0	------	0	51	3	13	0	0	0	2	11
Springfield	0	------	0	104	1	9	7	0	0	0	19
Michigan:											
Detroit	9	2	4	1,011	18	137	0	16	0	49	255
Flint	0	------	0	2	3	38	0	0	0	12	28
Grand Rapids	0	------	0	1	0	19	0	1	0	2	31
Wisconsin:											
Kenosha	0	----	0	3	0	5	0	0	0	5	11
Madison	0	------	0	1	2	5	0	0	0	1	6
Milwaukee	1	------	0	1,739	10	21	0	0	0	35	79
Racine	0	------	0	2	1	9	0	1	0	1	13
Superior	0	------	0	0	1	2	0	0	0	2	7

[1] Figures for Barre, Vt., and Wilmington, N. C., estimated; reports not received.

City reports for week ended Feb. 5, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	1	0	2	4	0	0	0	5	26
Minneapolis	0	------	3	2	2	24	0	1	0	1	101
St. Paul	0	------	0	3	9	8	8	2	0	0	59
Iowa:											
Cedar Rapids	0	------	------	1	------	2	1	------	0	2	------
Davenport	0	------	------	17	------	1	0	------	0	0	------
Des Moines	0	------	------	1	------	25	0	------	1	0	45
Sioux City	0	------	------	1	------	4	0	------	0	1	------
Waterloo	1	------	------	0	------	13	0	------	0	0	------
Missouri:											
Kansas City	1	------	2	130	15	22	0	6	0	9	122
St. Joseph	0	------	0	2	3	0	0	1	0	0	39
St. Louis	9	------	2	95	10	65	2	3	0	5	241
North Dakota:											
Fargo	0	------	0	1	2	4	0	0	0	6	8
Grand Forks	0	------	------	0	------	8	0	------	0	0	------
Minot	1	------	0	0	0	0	5	0	0	6	13
South Dakota:											
Aberdeen	2	------	------	0	------	0	0	------	0	4	------
Sioux Falls	0	------	0	0	0	2	0	0	1	0	9
Nebraska:											
Lincoln	1	------	0	1	0	6	0	0	0	2	12
Omaha	0	------	0	1	8	3	1	0	0	2	62
Kansas:											
Lawrence	0	------	0	0	0	0	0	0	0	1	8
Topeka	0	------	0	3	7	4	0	0	0	18	31
Wichita	2	------	0	1	5	7	0	0	0	3	28
Delaware:											
Wilmington	0	------	0	7	5	4	0	0	0	10	22
Maryland:											
Baltimore	7	7	2	5	32	22	0	12	1	35	222
Cumberland	0	------	1	0	0	1	0	0	0	0	10
Frederick	0	------	0	0	0	0	0	0	0	0	4
District of Columbia:											
Washington	5	3	2	13	27	21	0	13	0	9	208
Virginia:											
Lynchburg	4	------	0	0	3	1	0	0	0	1	13
Norfolk	2	------	0	50	5	10	0	3	0	2	38
Richmond	0	------	0	33	11	1	0	2	0	0	58
Roanoke	2	------	1	3	2	1	0	1	0	1	18
West Virginia:											
Charleston	1	1	0	131	13	1	0	1	0	1	40
Huntington	2	------	------	7	------	2	0	------	0	0	------
Wheeling	0	------	0	12	0	1	0	2	0	14	16
North Carolina:											
Gastonia	0	------	------	0	------	0	0	------	0	9	------
Raleigh	0	------	0	2	0	1	0	0	0	19	5
Wilmington	------	------	------	------	------	------	------	------	------	------	------
Winston-Salem	0	------	0	2	4	1	0	0	0	24	12
South Carolina:											
Charleston	0	49	0	172	5	1	0	0	0	0	25
Columbia	0	------	0	0	8	0	0	1	0	0	21
Greenville	0	------	0	0	0	1	0	0	0	11	5
Georgia:											
Atlanta	1	18	5	181	12	5	0	3	0	7	97
Brunswick	0	------	0	0	1	0	0	0	0	0	3
Savannah	0	18	0	3	5	1	0	3	1	0	33
Florida:											
Miami	0	1	0	89	4	0	0	1	0	6	34
Tampa	2	0	0	1	2	0	0	1	0	0	------
Kentucky:											
Ashland	0	4	------	0	4	0	0	3	0	2	44
Covington	0	2	0	0	2	0	0	1	0	1	10
Lexington	0	------	0	2	3	0	0	1	0	0	19
Louisville	0	14	0	182	10	40	0	3	0	8	80
Tennessee:											
Memphis	0	------	4	250	16	2	0	9	1	4	89
Nashville	1	------	3	17	8	6	0	0	0	0	65
Alabama:											
Birmingham	0	8	3	44	4	3	0	4	0	0	63
Mobile	1	1	1	4	3	0	0	1	1	0	22
Montgomery	0	4	------	12	------	0	0	------	0	0	------

City reports for week ended Feb. 5, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Arkansas:											
Fort Smith	0	------	------	1	------	0	0	------	0	1	------
Little Rock	0	------	1	60	3	0	0	0	1	2	------
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	2	2
New Orleans	7	11	8	0	23	6	0	13	1	0	182
Shreveport	0	------	1	0	5	6	0	2	1	0	31
Oklahoma:											
Muskogee	0	------	------	0	------	0	0	------	0	0	------
Oklahoma City	0	------	2	5	6	3	0	0	0	0	45
Tulsa	0	------	------	2	------	3	1	------	0	8	------
Texas:											
Dallas	3	3	2	1	8	15	0	7	1	5	73
Fort Worth	1	------	1	0	7	10	0	3	0	0	51
Galveston	0	------	0	0	1	3	0	0	1	0	18
Houston	6	------	1	1	17	3	0	5	1	3	98
San Antonio	0	------	3	1	15	2	0	7	0	1	76
Montana:											
Billings	0	------	0	1	2	1	0	1	0	0	9
Great Falls	0	------	0	0	0	1	1	0	0	13	5
Helena	0	------	0	0	1	0	0	0	0	0	4
Missoula	0	1	1	0	1	0	0	0	0	0	9
Idaho:											
Boise	0	------	0	0	1	0	10	0	0	0	8
Colorado:											
Colorado Springs	0	------	0	1	1	3	0	2	0	2	11
Denver	3	------	1	244	8	27	0	3	0	1	81
Pueblo	1	------	0	2	1	3	0	0	0	1	10
New Mexico:											
Albuquerque	1	------	0	6	0	2	0	0	0	3	14
Utah:											
Salt Lake City	0	------	2	25	2	19	3	0	0	2	39
Washington:											
Seattle	2	------	1	0	5	9	0	2	0	53	98
Spokane	0	------	0	2	4	2	1	1	0	6	40
Tacoma	0	------	0	0	2	6	0	0	0	26	25
Oregon:											
Portland	2	1	1	0	9	23	1	1	0	2	83
Salem	0	4	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	6	29	3	10	20	43	18	16	0	7	325
Sacramento	0	------	0	1	2	0	0	2	0	15	33
San Francisco	2	7	1	1	5	13	0	6	1	38	149

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Boston	1	0	0
New York:			
Buffalo	1	2	0
New York	8	5	1
Pennsylvania:			
Scranton	1	0	0
Ohio:			
Cleveland	3	0	0
Illinois:			
Chicago	2	0	0
Michigan:			
Detroit	0	0	1
Iowa:			
Des Moines	1	0	0

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Missouri:			
Kansas City	0	1	0
West Virginia:			
Charleston	2	2	0
South Carolina:			
Greenville	1	0	0
Kentucky:			
Louisville	2	0	0
Louisiana:			
Shreveport	0	1	0
Oklahoma:			
Tulsa	0	0	1
Texas:			
San Antonio	0	1	0

Encephalitis, epidemic or lethargic.—Cases: New York, 1.

Pellagra.—Cases: Baltimore, 1; Washington, 1; Charleston, S. C., 4; Atlanta, 1; Savannah, 3; Louisville, 1; San Francisco, 2.

Typhus fever.—Cases: Savannah, 2; San Antonio, 1.

FOREIGN AND INSULAR

DOMINICAN REPUBLIC

Vital statistics—Year 1936.—Following are the numbers of deaths from certain causes and rates per 100,000 population in the Dominican Republic for the year 1936:

Disease	Number	Rate per 100,000 population	Disease	Number	Rate per 100,000 population
Appendicitis	22	1.47	Influenza	123	8.19
Cancer and other malignant tumors	193	12.85	Leprosy	4	.27
Cerebral hemorrhage	95	6.33	Malaria	1,280	85.24
Cirrhosis of the liver	20	1.33	Measles	2	.13
Congenital debility	20	1.33	Nephritis (acute)	7	.47
Diabetes	8	.53	Nephritis (chronic)	83	5.52
Diarrhea and enteritis (under 2 years)	416	27.71	Pneumonia (lobar)	778	51.81
Diphtheria	28	1.87	Smallpox	4	.27
Dysentery	114	7.59	Suicide	10	.67
Erysipelas	3	.20	Syphilis	121	8.06
Hernia	1	.07	Tetanus	549	36.56
Hookworm disease	43	2.86	Tuberculosis (all forms)	958	63.80
			Typhoid fever	288	19.18
			Whooping cough	5	.33

SWEDEN

Notifiable diseases—December 1937.—During the month of December 1937, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	1	Poliomyelitis	[1] 65
Diphtheria	39	Scarlet fever	1,859
Dysentery	42	Syphilis	25
Epidemic encephalitis	2	Typhoid fever	10
Gonorrhea	829	Undulant fever	11
Paratyphoid fever	4	Weil's disease	2

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[1] Includes 3 cases nonparalytic at time of notification.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following table must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths; P, present]

Place		June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Week ended— November 1937				December 1937				January 1938				
						6	13	20	27	4	11	18	25	1	8	15	22	29
China:																		
Canton	C	62	80	102	14													
Hangchow	C			12	[1] 41													
Hoihow	C	160																
Hong Kong	C	7	964	580	84	4	1	1	1					1		1		
	D	7	497	344	63	3	1	3								1		
Kwangchow Wan	C		104		62	4	8											
	D		81		26	4	6											
Macao	C		286	190	27	1		1										
Manchuria:																		
Dairen	C				6													
Kwantung Leased Territory	C			3														
Mukden	C				2													
Nanking	C				120													
	D				14													
Shanghai	C		8	1,804	1,414	67	81	49	40	6	10	3	3	3				
Swatow	C		8	24	44	24	19	42	16	2								
Tientsin	C				8													
Chosen: Fusan	C			1														
Dutch East Indies:																		
Celebes	C			[2] 6														
Macassar	C															1		

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[1] For 2 weeks.
[2] El Tor strain.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

CHOLERA—Continued

[C indicates cases; D, deaths; P, present]

Place		June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 20–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Week ended—												
						November 1937				December 1937				January 1938				
						6	13	20	27	4	11	18	25	1	8	15	22	29
Federated Malay States	D	2																
India	C	13,803	18,250	12,203	11,344	1,020	1,806	2,108	1,799	1,664	1,503	1,215						
	D	6,495	7,976	5,768	5,787	195	1,016	1,172	1,024	835	831	560						
Assam	C	63	35	44	59	13	39	19	16	0	68	40	25	35	45	88	53	41
	D	34	25	16	25	11	23	13	6	1	13	24	18	22	22	40	34	23
Bassein	C	1																
Bombay Presidency	C	2,036	4,273	3,366	1,375	122	106	104	31	49	42	53	47	7	2			
	D	1,098	1,719	1,571	686	51	50	53	17	28	19	35	35	6	1			
Bombay	C	[3]1		[3]1														
Calcutta	C	92	77	56	83	19	21	18	22	19	23	15	12	6	23	24	30	33
Central Provinces and Berar	C	62	176	286	860	70	93	102	82	36	27	19	31	18	4	6	12	
Chittagong	C	5																
Delhi	C					1												
Madras Presidency	C	2,791	4,210	1,841	826	239	290	411	264	374	1,020	402	858					
	D	1,152	1,659	771	389	83	110	150	88	135	480	174	389					
Madras	C	16	64	70	106	32	61	44	96	52	29	30	49	38	32	24	10	16
	D	6	26	18	43	7	9	4	14	12	13	8	7	6	7	3	8	5
Negapatam	C		1	3	1													
	D	1		1														
Northwest Frontier Province	C		203	32	19													
Orissa Province	C	295	247	111	147	12	43	26	10	20	11	7	1	12	12	12	21	
Punjab	C	24	120	29														
Rangoon	C								1					1				
Sind State	C		1	1														
India (French):																		
Chandernagor Territory	C	2			4	2	1	1		1								
Karikal Province	C			1														
Pondichery Province	C			1	1							1						

Indochina (French): [4]																		
Annam Province	C	------	------	------	37	173	191	------	------	40	18	31	5	5	20	12	7	19
Tonkin Province	C	------	------	320	4,179	1,074	1,268	------	------	274	69	82	84	15	26	7	2	9
Haiphong	C	------	------	56	577	16	12	10	6	1	------	------	------	------	------	------	------	------
	D	------	------	30	159	18	9	------	------	------	------	------	------	------	------	------	------	------
Hanoi	C	------	------	------	284	83	95	106	77	21	8	8	2	------	3	------	------	------
Japan: [5]																		
Hiroshima	C	------	------	32	5	------	------	------	------	------	------	------	------	------	------	------	------	------
Kobe	C	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------
Okayama Prefecture	C	------	------	------	5	------	------	------	------	------	------	------	------	------	------	------	------	------
Taku	C	------	------	1	3	------	------	------	------	------	------	------	------	------	------	------	------	------
Tokuyama	C	------	------	------	10	------	------	------	------	------	------	------	------	------	------	------	------	------
Tokyo	C	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------
Siam: [6]																		
Bangkok	C	5	1	------	2	------	------	------	------	------	------	------	------	------	------	------	------	------
Provinces	C	151	42	16	7	------	------	------	------	------	------	------	------	------	------	------	------	------

On vessels:

S. S. *Talamba* at Port Swettenham from Madras	2 cases	June 27, 1937
S. S. *Chungking* at Bangkok from Hoihow	1 case	July 15, 1937
S. S. *Kwantung* at Hong Kong from Hoihow	1 case	July 21, 1937
S. S. *Kiangsu* [7] at Singapore from Hong Kong	1 case	July 22, 1937
S. S. *Eagle* at Hong Kong from Kongmoon	1 case	July 27, 1937
S. S. *Mutnam* at Singapore from Hong Kong	2 cases	Aug. 16, 1937
S. S. *Sandtiken* at Hong Kong	Present	Aug. 18, 1937
S. S. *Haiching* at Hong Kong	Present	Do.
S. S. *Talma* at Singapore from Hong Kong	1 case	Aug. 20, 1937

On vessels—Continued.

S. S. *Cremer* at Singapore from Amoy, Hong Kong, and Swatow	1 case	Aug. 24, 1937
S. S. *Tyndareus* at Kobe from Hong Kong and Dairen	1 case	Aug. 27, 1937
S. S. *Manila Maru* at Moji from Hong Kong	1 case	Aug. 31, 1937
S. S. *Anking* at Singapore from Hong Kong	1 case	Sept. 10, 1937
S. S. *Sphinx* at Singapore from Hong Kong	1 case	Sept. 15, 1937
S. S. *Kiangchow* at Hong Kong from Shanghai	3 cases	Oct. 3, 1937
S. S. *Ranee* at Calcutta from Port Said and Blyth	1 case	Dec. 13, 1937

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[3] Imported.

[4] For reports prior to June 27, 1937, see previous issues of PUBLIC HEALTH REPORTS.

[5] A report states that up to Sept. 30, cholera was reported in Japan, as follows: Hiogo Prefecture, 1 case, 1 death; Hiroshima Prefecture, 40 cases, 14 deaths; Yamaguchi Prefecture, 2 cases, 1 death.

[6] During the week ended Feb. 5, 1938, 3 fatal cases of cholera were reported in Nagara Nayok Province, Siam.

[7] In addition, for week ended July 28, 3 cases with 2 deaths in contacts.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE[1]

[C indicates cases; D, deaths; P, present]

Place		June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Week ended— November 1937 6	13	20	27	December 1937 4	11	18	25	January 1933 1	8	15	22	29
Algeria: Algiers	C	1																
Argentina. (See table below.)																		
Belgian Congo	C				[2] 2								2					
Bolivia: Tarija Department	C																	50
Brazil. (See table below.)																		
British East Africa:																		
Kenya	C	42	16	11	15	7		3										
Tanganyika	C		1															
Uganda	C	47	32	50	51	28	12	17	10	14	6	10	8	5	6			
	D	43	32	48	40	20	13	14	10	12		10	8	5	6			
Ceylon:																		
Colombo	C		1		1				1		1			1				
	D		1		1				1		1				1			
Plague-infected rats		1		2	3													
China:[3]																		
Dutch East Indies:																		
Java and Madura	C	226	215	213	223	74	72	72										
	D	224	215	212	220	74	72	72										
Pasoeroean (vicinity of)	C	1				3		1	1	2								
Ecuador (see also table below):																		
Colimes	C														1			
Guayaquil	C		1		2						1		1		1	1	1	1
	D	1	1		2						1					1	1	
Plague-infected rats		2	2	1	2			3		1			1					
Parroquia Eloy Alfaro	C								1									
Egypt:																		
Asyut Province	C					1								1				
Beheira Province	C											1						
Gharbiya Province	C																1	
Girga Province	C				1													
Hawaii Territory:[4] Plague-infected rats:																		
Hawaii Island—Hamakua District:																		
Hamakua Mill Sector[4]			8	4	8			1	3	7			1	1				
Honokaa Sector		3																
Paauhau Sector		1	1	1	1		3		2				2		1	2	3	2
Paauilo										2	13	3						

Maui Island:																		
Makawao District—Plague-infected rats										1	3	2						
Omaopio [4]				1														
Wailuku District—Puunene	D														1			
India	C	558	962	1,607	1,906	405	364	470	575	410	400	391						
	D	356	522	747	821	187	188	159	208	215	175	164						
Bassein	C	1	2	2										1				[6]1
Plague-infected rats		1																
Bombay Presidency	C	33	43	62	82	20	11	16	12	15	10	10	16	8				
	D	20	25	42	48	9	11	8	8	17	8	4	8	4				
Central Provinces and Berar	C	10	85	285	582	120	84	183	205	109	147	80	54	36	91	58	113	168
Cochin	C			2		1												
Karachi	C			12														
Madras Presidency	C	106	203	111	80	43	45	74	13	23	52	16	69					
	D	63	98	59	41	20	23	28	13	13	28	5	38					
Punjab	C		17															
Rangoon	C	[5] 2	5															
Sind State	C			8														
Indochina (French) (see also table below): Sadec	C	1		1														
Madagascar. (See table below.)																		
Peru. (See table below.)																		
Senegal:																		
Dakar	C	1		1														
Tivaouane	C	1																
Tunisia: Tunis	C	2																
Plague-infected rats		1										1						
Union of South Africa	C			[6] 1	[6] 1													
United States: [7]																		
California: [7] [8] [9]																		
Eldorado County—Plague-infected fleas.																		
Fresno County [8]	C			1														
Plague-infected fleas.																		
Plague-infected ground squirrels				3														
Placer County [8]—Plague-infected fleas.																		
San Bernardino County—Plague-infected fleas.																		
San Mateo County—Plague-infected fleas, lice, and ticks.																		
Idaho: [7] Bannock County—Plague-infected fleas and ticks.																		
Montana:																		
Beaverhead County — Plague-infected ground squirrel		1																
Madison County—Plague-infected squirrels			2															
Nevada: [7]																		
Douglas County—Plague-infected fleas.																		
Ormsby County—Plague-infected fleas and lice.																		
Utah: [7]																		
Morgan County—Plague-infected fleas.																		
Wasatch County—Plague-infected ground squirrel			1															

See footnotes at end of table.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths; P, present]

Place		July 1937	August 1937	September 1937	October 1937	November 1937	December 1937
Argentina:							
Cordoba Province	C			1			
Mendoza Province	C	[10] 9					
Salta Province	C		[10] 1				
Santiago del Estero Province	C	[10] 6					
Brazil:[11] Pernambuco State	C		5			5	
Indochina (French) (see also table above):							
Cambodia	C	2					
Cochinchina	C	2		1			
Madagascar (central region)	C	25	22	48	50	67	
	D	24	22	47	59	65	
Peru	C	7	3	5	9	12	6
Ancash Department	C					3	
Lambayeque Department	C	1	2	2	1		
Libertad Department	C	4	1		2	1	
Salaverry	C	8					
Lima Department	C	2		3	6	8	6

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[1] Including plague in the United States and its possessions.

[2] Includes 1 case of pneumonic plague.

[3] Plague has been reported in China as follows: Information dated Aug. 18 reports an outbreak in West Hsingan (Khingan) and Southern Lungkiang Provinces. Information dated Sept. 2 states that 115 cases and 105 deaths occurred in Manchuria.

[4] Plague has also been reported in Hawaii Territory as follows: Week ended Aug. 14, 1937, 1 lot of 5 rats and 1 lot of 3 mice, by mass inoculation in Hamakua Mill Sector; week ended Nov. 20, 10 rats by mass inoculation in Omaopio, Makawao District, Maui Island.

[5] Imported.

[6] For 2 weeks.

[7] Plague infection proved in insect hosts as follows: *California*—Eldorado County, Aug. 31; Fresno County, Oct. 7–Nov. 5; San Bernardino County, July 12–Sept. 8; San Mateo County, July–Aug. 27. *Idaho*—Bannock County, July 8. *Nevada*—Douglas County, July 29–31; Ormsby County, July 2–Aug. 20. *Utah*—Morgan County, reported Aug. 10.

[8] For 5 weeks ended Nov. 6, plague infection proved in pooled tissue from squirrels, chipmunks, and mice in Fresno County, Calif.

[9] For week ended Oct. 9, plague infection proved in pooled tissue from squirrels, chipmunks, and rats, and week ended Oct. 30, pooled tissue from squirrels, in Placer County, Calif.

[10] Pneumonic plague.

[11] For the year 1937, 35 cases of plague with 15 deaths were reported in Brazil as follows: Bahia State, 5 cases, 5 deaths; Ceara State, 2 cases; Parahyba State, 5 cases, 1 death; Pernambuco State, 23 cases, 9 deaths.

SMALLPOX

Place		June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Week ended—												
						November 1937				December 1937				January 1938				
						6	13	20	27	4	11	18	25	1	8	15	22	29
Algeria: Algiers Department	C				1													
Angola. (See table below.)																		
Argentina. (See table below.)																		
Belgian Congo. (See table below.)																		
Bolivia. (See table below.)																		
Brazil:																		
Bahia (alastrim)	C	16	10	6	3													
Porto Alegre (alastrim)	D	2	2															
Recife (alastrim)	C			1														
Santos	C								1									
British East Africa:																		
Kenya	C	116																
Tanganyika	C	65	186	121		100	223											
Canada:																		
Alberta	C	5														[1] 1		
Quebec	C					[1] 1												
Saskatchewan	C		[1] 1													[1] 1		
China:																		
Canton [2]	C											1	1					
Dairen	C	2	2				1											
Foochow	C	P	P	P	P	P		P				P						
Hangchow	C	1																
Hankow	C		1															
Hong Kong	C	9	82		1	1			5	4	2		7	8	30	26	75	81
Shanghai	C	29	2	1							1						3	
Tientsin	C											1						
Colombia (see also table below): Barranquilla	D	1			2													
Ecuador: Guayaquil	C	37	20	3	13	2			2		2		1	2	1		1	
Egypt: Port Said	C	1																
Eritrea	C	2		28	52	9	7											
France. (See table below.)																		
Great Britain: England and Wales—Chester County	C							1										
Greece: Salonika	C	24																

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[1] For 2 weeks.

[2] A report dated Feb. 12, 1938, states that for the 3 weeks ended Feb. 12, 1938, 100 cases of smallpox were admitted to hospitals in Canton, China.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Week ended—												
						November 1937				December 1937				January 1938				
						6	13	20	27	4	11	18	25	1	8	15	22	29
Guatemala. (See table below.)																		
India	C	6,578	3,026	1,738	1,756	336	466	364	638	718	959	1,205						
	D	1,875	910	461	429	70	99	68	171	147	224	297						
Assam	C	107	98	58	45	5	10	5	17	12	16	20	8	21	13	13	19	29
Bombay Presidency	C	331	177	181	154	5	49	35	41	102	83	205	180	229	208			
	D	106	53	38	33	3	17	9	12	27	28	51	59	57	67			
Bombay	C	104	28	47	41	5	23	26	19	50	43	66	110	82	92	161	163	189
	D	69	18	24	23	3	8	9	10	19	23	24	54	47	49	86	81	87
Calcutta	C	14	40	28	20	5	5	5	9	3	15	20	31	43	46	46	52	48
	D	10	16	17	14	1	3	4	5	2	11	13	17	31	35	34	31	46
Central Provinces and Berar	C	153	61	44	26	4		1	2	1		8	6	2	9	11	22	7
Chittagong	C	2													1		2	
Delhi	C	12	7		1						1	2	3	2	[3] 4		1	2
Karachi	C	2		[3] 2		[3] 1		1		[3] 1			3	3	[3] 3	6	3	3
Madras Presidency	C	162	415	318	304	66	67	50	30	30	62	30	123					
	D	104	95	62	51	7	3	12	4	6	15	5	25					
Madras	C	95	102	76	74	14	13	9	14	10	10	19	49	58	50	64	107	80
Northwest Frontier Province	C	171	76	27	154	112	70	20	178	16	113	139	149	277	106	88	202	75
Orissa Province	C	462	310	117	193	40	81	35	50	63	94	69	127	102	147	93	287	
Punjab	C	560	165	69	162	55	182	138	29	192	300	226	317	310	332	380	337	
Rangoon	C		[3] 1		3			4	1		1		5	7	9	17		14
Sind State	C	279	209	96	78	19	41	68	36	75	79	52	230	97	67	119	201	159
Indochina (French) (see also table below):																		
Saigon-Cholon	C	1																
Tonkin Province	C												26		75	60		
Haiphong	C						2				4	21	11	14	41	32	31	
Hanoi	C												1	1		2	1	
Iran	C		3			2												
Teheran	C		1															
Iraq	C	2	5											5		6		
Italian Somaliland	C	1																

Mexico (see also table below):																		
Chihuahua	C	1	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Ciudad Juarez	D	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Durango	D	1	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------
Mazatlan	C	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Mexico, D. F	C	10	8	6	5	5	5	1	------	2	------	------	------	------	------	------	------	------
Monterrey	C	1	1	2	------	------	------	1	------	1	------	------	------	------	1	1	2	1
San Luis Potosi	D	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------
Torreon	C	7	3	1	------	------	------	------	------	------	1	------	1	------	1	------	5	1
	D	11	7	3	5	------	------	------	4	1	2	------	4	------	2	------	1	1
Vera Cruz	C	------	------	------	------	------	------	------	------	1	------	------	------	------	------	------	------	------
Morocco. (See table below.)																		
Nigeria	C	229	71	11	156	------	29	------		------	50	------	------	------	------	------	------	------
Nyasaland	C	1	12	------	31	2	5	4	------	------	------	3	------	------	------	------	------	------
Panama Canal Zone: Colon	C	------	------	------	2	------	------	------	------	------	------	------	------	------	------	------	------	------
Portugal (see also table below):																		
Lisbon	C	6	1	5	3	------	1	1	1	------	1	------	1	------	------	4	------	------
Oporto	C	1	------	2	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Senegal. (See table below.)																		
Siam	C	3	1	------	------	------	------	------	------	------	------	------	------	35	------	12	------	------
Sierra Leone	C	------	5	------	10	------	------	------	------	------	------	------	------	------	------	------	------	------
Southern Rhodesia	C	------		------	4	------	100	21	------	12	------	3	99	------	------	------	------	------
Sudan (Anglo-Egyptian)	C	8	6	27	64	7	58	13	10	14	13	18	19	44	28	2	81	127
Unfederated Malay States: Kedah	C	P	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Venezuela: Puerto Cabello.[4]																		

On vessels:		
S. S. *Empress of Japan* at Kobe from Manila	1 case	Aug. 11, 1937
S. S. *Northern Prince* at New York from Rio de Janeiro	1 case	Aug. 19, 1937
S. S. *Empress of Asia* at Honolulu	1 case	Sept. 5, 1937

On vessels—Continued.		
S. S. *Castalia* at Suez from Karachi and Bombay	1 case	Oct. 5, 1937
S. S. *Egra* at Rangoon from Calcutta	1 case	Nov 16, 1937
S. S *Tatsuta Maru* at Honolulu	1 case	Feb 4, 1938

[3] Imported.

[4] A report dated Feb. 10, 1938, states that 16 cases of smallpox were reported in Puerto Cabello, Venezuela.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		July 1937	August 1937	September 1937	October 1937	November 1937	December 1937
Angola	C		12	18			
Argentina	C				3	1	
Belgian Congo	C	300	312	391	352	166	
Bolivia: La Paz	C			30			
China: Manchuria—Harbin	C	1					
Colombia (see also table above)	C		[1] 209				
France	C					2	
Guatemala	C		1				
Indochina (French) (see also table above)	C	143	226	96	147	197	319
	D	30	63	12	28	43	91
Mexico (see also table above):							
Aguascalientes State	C			5			
Campeche State	C			1			
Chihuahua State	C			4		21	
Coahuila State	C			2		17	
Durango State	C			15		17	
Guanajuato State	C			7		38	
Hidalgo State	C			1			
Jalisco State	C			5			
Mexico—Continued.							
Mexico State	C			3		3	
Mexico, D. F	C	18	9	11	5	17	
Mexico City	D	3	1	2			
Michoacan State	C		4	37		59	
Nayarit State	C			1			
Nuevo Leon State	C			2		6	
Monterrey	C	1					
Queretaro State	C		1	5	1	2	
Sinaloa State	C			3			
Tabasco State	C			1		1	
Tlaxcala State	C			3		3	
Vera Cruz State	C			2	1	25	
Yucatan State	C	1				1	
Zacatecas State	C			1		7	
Morocco	C	4		1	1	2	
Portugal (see also table above)	C			61	53	52	
	D			8	4	4	
Senegal	C	16					

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[1] For July and August.

TYPHUS FEVER

Place		June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Week ended—															
					October 1937					November 1937				December 1937				January 1938		
					2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15
Algeria:																				
Algiers Department	C	197	30	7		20	2		16	18		[1] 27	44		6		7			
Algiers	C	73	3						15											
Constantine Department	C	203	83	26	2	9	2		34	1		[1] 14	8	29	37		15	21		[1] 26
Bone	C	15	4						1						1					
Constantine	C	22	7	2					7											
Philippeville	C	1							2				1							
Oran Department	C	16	7	4								[1] 13	3	2			20	1		[1] 3
Southern Territories	C	4	1										2		1					
Basutoland	C		9	6				[2] 3												
British East Africa: Kenya	C																			1
Bulgaria	C				12		1													
Chile	C	273		176	57	66	71	61	50	59	50	75	102							
Antofagasta Province	C	1		1						1	1	1	1							
Concepcion Province	C	32	16	7			4				1	1								
Iquique	C									1						1				
Linares Province	C	9	6	5	2						1	1	10							
Malleco Province	C	5	8	6		2	1	1		2		1								
Nuble Province	C	7	3	14	1	17	2	1	3	9	5		5							
Santiago Province	C	137	151	114	50	38	47	53	42	35	40	65	83							
Valparaiso	C	50	47	14	5	4	5	1	1		1	2	2	1					1	2
China (see also table below):																				
Canton	C							1	2											
Dairen	C					1							2			1				
Hankow	C	1	1						2											
Shanghai	C	5		2																
Swatow	C	3																		
Tientsin	C	1	1	3				1		4		1	2	4						
Tsingtao	C	1																		
Chosen. (See table below.)																				
Egypt:																				
Alexandria	C	6	13	4		2	2			3	1	3		2			1	1		
Asyut Province	C	6	2					1												
Beheira Province	C	23	1																	
Beni-Suef Province	C									1										
Cairo	C			1											1			3		
Dakahliya Province	C	31	3																	

[1] For 2 weeks.
[2] For 3 weeks.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER—Continued

[C indicates cases; D, deaths; P, present]

Place		June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Week ended—															
					October 1937					November 1937				December 1937				January 1938		
					2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15
Egypt—Continued.																				
Faiyum Province	C	1																		
Gharbiya Province	C	41																		
Girga Province	C	2																		
Giza Province	C	2																		
Minufiya Province	C	4																		
Minya Province	C		1																	
Port Said	C	2																		
Sharkiya Province	C	1																		
Suez	C	2		2																
Provinces	C	130		10	1	1	1			2	4		1	1		4	2	6	11	12
Eritrea: Asmara	C	1									2									
Germany: Frankfort-on-Main	C				1															
Great Britain—England and Wales—Gloucester County	C											1								
Greece. (See table below.)																				
Guatemala. (See table below.)																				
Hawaii Territory: Honolulu	C	4	1	2	2		2					1				1		1	1	
Hungary	C	1																		
Iran	C			1												4				
Iraq:																				
Baghdad	C	2																		
Kirkuk Province	C	2																		
Latvia. (See table below.)																				
Libya. (See table below.)																				
Lithuania. (See table below.)																				
Mexico (see also table below):																				
Chihuahua	C												2							
Mexico, D. F.	C	2	27	22	3	5	2	3	4	4	3	7	4	13	3	3	1			12
Torreon	C										1									
Morocco (see also table below)	C	85	21	16	1	17	11	7	2	1		6	22	18	58	102	137	198	80	
Casablanca	C	5	5			4										4	20		16	6
Netherlands: Rotterdam	C															[3] 1				

Palestine:																				
Haifa	C	3	4	11	3	------	7	------	6	3	------	2	------	3	3	2	------	2	------	------
Jaffa	C	3	9	9	1	------	6	5	1	2	5	4	6	------	------	2	1	------	------	3
Panama Canal Zone. (See table below.)																				
Poland	C	89	43	26	9	9	9	19	7	12	10	23	23	37	40	35	29	54	98	------
	D	1	4	------	------	------	------	1	------	2	1	------	2	------	1	1	1	1	6	------
Portugal. (See table below.)																				
Rumania. (See table below.)																				
Sierra Leone: Freetown	C	------	------	------	------	------	------	------	------	------	------	------	------	1	------	------	------	------	------	------
Straits Settlements: Singapore	C	------	------	1	------	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------
Switzerland	C	1	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Trans-Jordan	C	1	------	------	------	------	------	------	------	------	1	------	------	------	------	------	------	------	------	------
Tunisia:																				
Tunis	C	4	10	7	------	------	2	1	------	------	------	3	------	1	------	------	1	2	------	------
Provinces	C	337	216	76	1	38	24	40	29	23	29	63	46	11	34	------	12	12	26	------
Turkey. (See table below.)																				
Union of South Africa. (See table below.)																				
Yugoslavia: Belgrade	C	------	------	------	------	------	------	------	------	1	------	------	------	------	------	------	------	------	------	------

Place		July 1937	August 1937	September 1937	October 1937	November 1937	December 1937
China: Manchuria—Harbin	C	14	8	2	--------	--------	--------
Chosen	C	--------	--------	--------	19	--------	--------
Greece	C	5	3	6	18	--------	--------
Guatemala	C	16	10	6	2	--------	--------
Latvia	C	--------	--------	1	--------	--------	--------
Libya	C	10	--------	--------	--------	--------	--------
Lithuania	C	7	--------	2	6	7	--------
Mexico (see also table above):							
Aguascalientes State	C	--------	--------	1	--------	1	--------
Campeche State	C	--------	--------	2	--------	--------	--------
Durango State	C	--------	--------	1	--------	8	--------
Guanajuato State	C	3	--------	19	--------	22	--------
Hidalgo State	C	--------	3	4	2	19	--------
Jalisco State	C	1	--------	2	--------	2	--------
Mexico State	C	14	38	29	19	42	--------
Mexico D. F	C	16	27	29	14	20	--------
Mexico City	D	5	3	4	--------	--------	--------
Michoacan State	C	--------	--------	5	--------	11	--------
Puebla State	C	--------	--------	55	--------	9	--------
Mexico—Continued.							
Queretaro State	C	--------	2	3	2	2	--------
San Luis Potosi State	C	--------	--------	6	4	--------	--------
Tamaulipas State	C	--------	--------	2	--------	--------	--------
Tlaxcala State	C	--------	--------	3	--------	--------	--------
Vera Cruz State	C	--------	--------	9	--------	--------	--------
Zacatecas State	C	--------	--------	2	--------	6	--------
Morocco (see also table above)	C	88	25	16	39	47	914
Panama Canal Zone	C	--------	1	1	--------	--------	--------
Portugal	C	--------	2	1	26	28	--------
Rumania	C	61	26	31	33	68	--------
Turkey	C	30	23	27	100	--------	--------
Istanbul	C	2	2	4	--------	4	2
Union of South Africa:							
Cape Province	C	50	81	--------	162	75	--------
Natal	C	--------	2	--------	--------	9	--------
Orange Free State	C	11	2	--------	3	3	--------
Transvaal	C	13	--------	--------	5	1	--------

[1] Suspected

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER

[C indicates cases; D, deaths; P, present]

Place		June 27–July 31, 1937	Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Week ended—																
					October 1937					November 1937				December 1937				January 1938		
					2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15
Belgian Congo: Zongo.[1]																				
Brazil:																				
Amazonas State	D		1																	
Matto Grosso State [2]	D	1																		
Minas Geraes State	D																		1	2
Para State [2]	D	6	1	1																
Santa Catharina State	D													1						
Sao Paulo State.[3]																				
Colombia:																				
Boyaca Department	C	2	1																	
	D	4	2				1									1				
Caldas Department	D			1																
Cundinamarca Department	D	1	2	2																
Intendencia of Meta—Villavicencio	D			1																
Santander Department	C			2																
	D	1	4	6	1				2						1		2			
Dahomey: Cotonou	C															[4] 5				
French Equatorial Africa:																				
Bangui	D			1																
Fort Archambault	C			[4] 2																
Libreville	C	1																		
	D	1																		
Gambia: Georgetown	C																			[4] 1
Gold Coast	C	23	9	3	1	1		1	1	[5] 7			[4] 1			2		[5] 5	[5] 4	
	D	19	4	2	1					2			[4] 1			2				
Accra	C	2	1	[4] 1																
Keta	C																	1		
Ivory Coast:																				
Abidjan.[6]																				
Agboville	C		1																	
Anyama	C																		1	
Gaoua	C			[5] 3										[4] 1						
	D			1																
Touba	C			[4] 1		[4] 1														

Nigeria	C	7	5	2		2	1	[4] 1	[4] 1				2				[4] 1	1		1
	D	3											1							1
Paraguay	C	P																		
Asuncion	C											1								
Senegal	C		2	2	1	4	4		3	[7] 8	2		2	1		1	1			
	D		1							1			1							
Dakar	C					[8] 1				[8] 2										
Rufisque	C				1		1				2									
Thies	C						2		2				1							
Sudan (French)	C																	1		
San	C																1	1		
Toukoto	C										[4] 1									

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[1] A report dated Feb 11, 1938, states that yellow fever is present in Zongo, Belgian Congo
[2] See also reports of yellow fever in Brazil on pp. 463, 536, 657, 653, 702, 818, 912, 1134, 1248, 1327, 1471, 1637, and 1691 of the PUBLIC HEALTH REPORTS for 1937
[3] A report dated Feb 8, 1938, stated that the presence of yellow fever has been confirmed in Sao Paulo State, Brazil.
[4] Suspected
[5] Includes 1 suspected case.
[6] During the week ended Feb. 5, 1938, 1 case of yellow fever was reported in Abidjan, Ivory Coast.
[7] Includes 3 suspected cases.
[8] Imported

UNITED STATES TREASURY DEPARTMENT

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IN THIS ISSUE

Bactericidal Treatment of Milk Cans in Hot-Air Cabinets
Experiments on the Toxicology of Phenyldichlorarsine
Description of a Modified Cell for Use in Dust Counting

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DIVISION OF SANITARY REPORTS AND STATISTICS

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PUBLIC HEALTH REPORTS

VOL 53 MARCH 4, 1938 NO. 9

STUDIES OF THE BACTERICIDAL TREATMENT OF MILK CANS IN HOT-AIR CABINETS

By Leslie C. Frank, *Senior Sanitary Engineer*, Frederick J. Moss, *Sanitary Engineer*, A. W. Fuchs, *Senior Sanitary Engineer*, W. H. Haskell, *Milk Specialist*, M. M. Miller, *Associate Milk Specialist*, R. C. Thomas, *Associate Milk Specialist*, and M. K. Havens, *Senior Medical Technician, Office of Milk Investigations, United States Public Health Service*

In view of the fact that hot-air cabinets for the bactericidal treatment of milk utensils and containers are coming into wider use by the dairy industry, it appeared desirable to conduct experiments to determine an effective and practicable temperature and holding time that will insure the desired reduction of milk-borne pathogens.

In conducting the experimental work the following principles were considered important:

(1) It would be faulty merely to test several commercial models of hot-air cabinets and to conclude that the temperature and holding time combination which was found to be effective for such cabinets would be effective for all hot-air cabinets. Hot-air cabinets usually show large simultaneous variations in internal temperature, and the commercially placed thermometers are not in all cases located in the coldest zone. Again, the maximum internal temperature differences vary with the size of the cabinet, its shape, the material of which it is constructed, the manner in which it is baffled, if at all, the manner in which the hot air is introduced, the manner in which the cabinet is vented, and the arrangement, amount, and type of contents to be treated.

Hence, if the cabinet tested is poorly constructed, the derived temperature and holding time will be higher than is really necessary for better constructed cabinets, and, conversely, if the cabinet tested is one of the best types the derived temperature and holding time would be inadequate for any less perfect cabinet.

Hence, in conducting such tests it was considered necessary either to determine the actual air temperature immediately surrounding each individual piece of equipment, or to reduce the variations in temperature within the test cabinet to a minimum at least as low as the lowest variations which would be likely to occur in commercial cabinets. This latter can be done by means of an electric fan, and this procedure was used in our tests. If now the temperature and time combination so derived is applied in practice, only one requirement need be made to insure effectiveness and fairness for all cabinets, namely, that the thermometer must be located in the coldest zone. This determination should be made by the manufacturers and checked by the health department.

(2) It would be faulty to test the effectiveness of hot-air treatment by determining the reduction of the "run of the mill" bacterial flora found on dirty milk cans. Such tests would be misleading, since the holding time and temperature thus determined would obviously vary with the variations in the mean thermal resistance of the "run of the mill" flora. The mean thermal resistance of such a variable flora might be higher than that of the most heat-resistant milk-borne pathogen on some days and lower on others.

Therefore it seemed imperative that a proper criterion organism be employed in pure culture. The thermal resistance of the test organism selected should be at least equal to, but not necessarily much higher than, that of the most resistant pathogen transmissible through milk supplies.

It is generally accepted that 140° F. for 30 minutes will devitalize all milk-borne pathogens. Park (*1*) found, for example, that *B. tuberculosis* is devitalized in milk at 140° F. in 15 minutes. All of 200 strains of hemolytic streptococci from septic sore throat, scarlet fever, etc., were killed at 140° F. in 30 minutes, most of them at 136° F. or less (*2*). For our tests use was made of a pure strain of *E. coli* which was isolated several years ago from milk by one of us in our attempt to find a nonpathogenic strain which would serve as a criterion or test organism for testing the efficiency of pasteurization and heat sterilization processes. This pure strain, when tested by laboratory methods similar to those used in Park's tests with pathogens, was found to be devitalized in milk at 140° F. in 51 minutes. The criterion organism was therefore somewhat more resistant to heat than any of the milk-borne pathogens reported in the literature.

The criterion organism, when cultured as later described and then suspended in distilled water buffered at pH 7.2 with phosphate buffers, had a thermal resistance such that a reduction of 99.99 percent was obtained at 140° F. in about 33 minutes. It was therefore assumed that a time and temperature combination which would produce a 99.99 percent reduction of this organism, plus an arbitrary margin of safety, would be satisfactory as a bactericidal treatment of dairy and milk plant equipment.

Equipment.—The hot-air cabinet used has a capacity of about 46 cubic feet. It is constructed of galvanized iron with double walls and top, thus giving a 1-inch air space insulation between the inner and outer walls. The space under the bottom of the cabinet was closed in with asbestos board to provide a shielded location for the gasoline

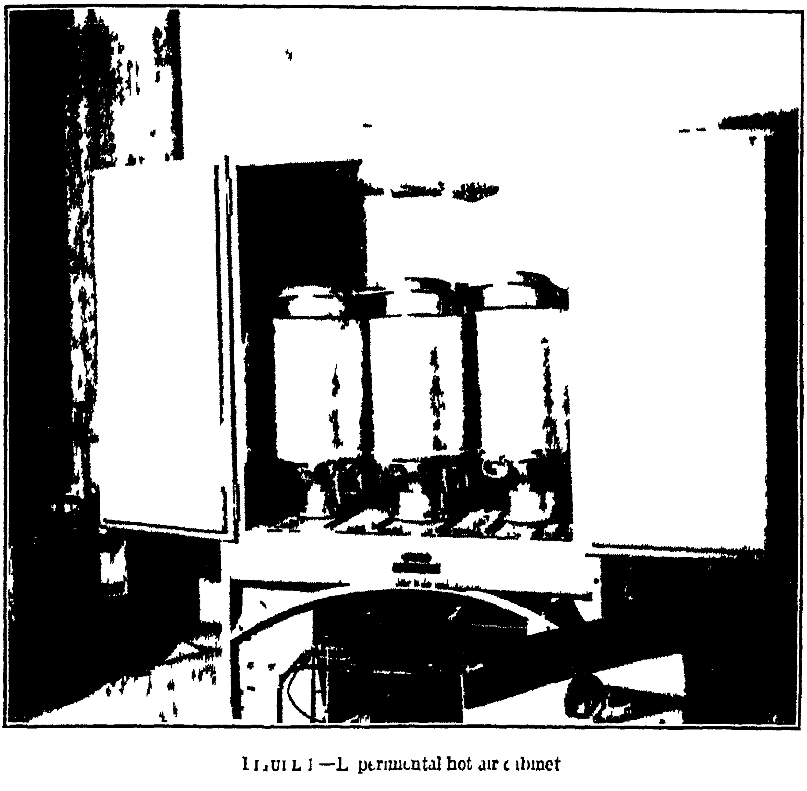


FIGURE 1.—Experimental hot air cabinet

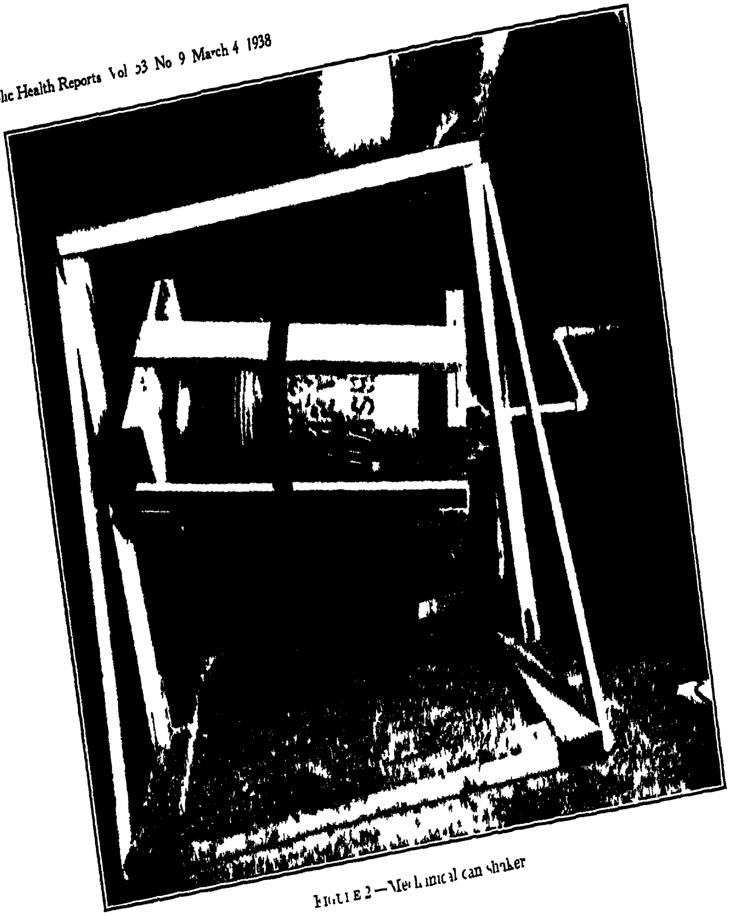


FIGURE 2.—Mechanical can shaker

burners. A flue equipped with a damper was inserted in one side of the cabinet near the back.

To minimize differences in internal temperatures a 16-inch fan was installed in the top of the cabinet. Ten glass laboratory-type thermometers were inserted through the sides and top of the cabinet. Two 5-inch gasoline burners were used. The accompanying illustration (fig. 1) shows the cabinet with the front asbestos shield pulled aside and the burners pulled forward.

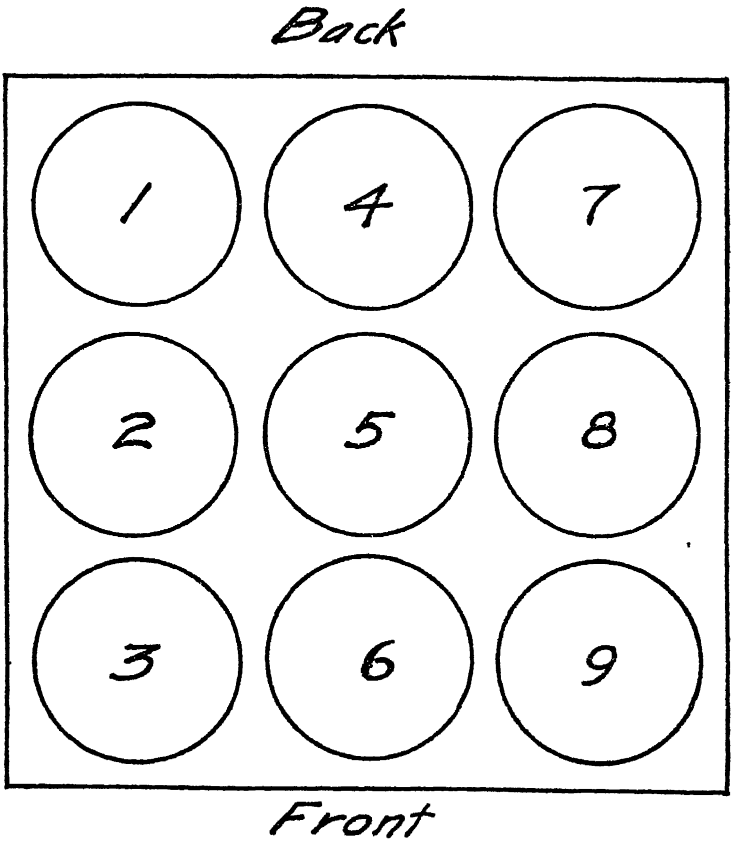


FIGURE 3.—Can locations

Culturing of the test organism.—The organism used has the following characteristics:

Sugar fermentation.—Sucrose negative, acid and gas in lactose, dextrose, dulcitol, maltose, salicin, mannite, and dextrin.

Indol is produced.

Nitrates are reduced to nitrites.

Motility positive.

Citrate negative.

Eosin—methylene blue agar—metallic sheen.

Agar plate colonies—bluish to gray.

Agar slant colonies—yellowish gray.

New stock cultures were made every month and, at the same time, a new transfer was started for use in the thermal resistance runs. This new culture was carried in daily transfers on agar slants and was not used for a thermal resistance run until it had been transferred daily for at least 1 week. The stock cultures and all media were stored in the ice box. Slants were incubated 2 days before use to dry out the excess moisture. Culture bottles were incubated for 24 hours before inoculation to insure the media being at incubation temperature when inoculated. The organism was grown at 37° C. for 24 hours. Plates for counting were incubated at 37° C. for 48 hours.

The culture for use in heat-resistance runs was grown on the surface of 225 cc of agar in a pyrex flask of the Roux type of 1,000-cc capacity. Each flask was inoculated with 3 cc of culture (about 2,000,000,000 to 3,000,000,000 organisms per cc) washed from a 24-hour slant with 5 cc of sterile water. The culture was incubated for 24 hours at 37° C. and was then washed off with 10 cc of sterile buffered distilled water, poured into a sterile egg-beater jar, beaten about 100 turns, and then filtered through a no. 14, 32-cm folded Whatman filter paper. Two flasks of culture suspended in one liter of water gave an average plate count per cc of 520,000,000. This suspension was used to contaminate the cans. The agar used for growing the culture and for plating was Difco dehydrated media, Standard Methods formula, pH 6.7.

Buffering of the distilled water.—The buffered distilled water used was prepared as follows:

(*a*) 39. 2 cc of m/15 dibasic potassium phosphate.
(*b*) 14. 5 cc of m/15 monobasic potassium phosphate.
(*c*) 946. 3 cc of distilled water
1, 000 cc—Total.

m/15 solution of dibasic potassium phosphate contains 11.62 grams per liter.

m/15 solution of monobasic potassium phosphate contains 9.06 grams per liter.

Merck's blue label phosphates were used.

The distilled water was obtained by condensing steam on the inside of a tubular milk cooler.

Testing procedure.—The following procedure was used in conducting the tests:

(1) Nine 10-gallon cans and covers were thoroughly washed, placed in the cabinet, and heated to a sufficient temperature and for a sufficient length of time to insure practical sterility. The cans used were in good condition, free from rust and excessive rough spots. This was

considered important, as otherwise it would be difficult to standardize the amount of the culture which would adhere to the cans.

(2) After cooling, two of the cans were each rinsed with 500 cc of sterile water to determine their bacterial count before inoculation with the test organism, thus affording a control.

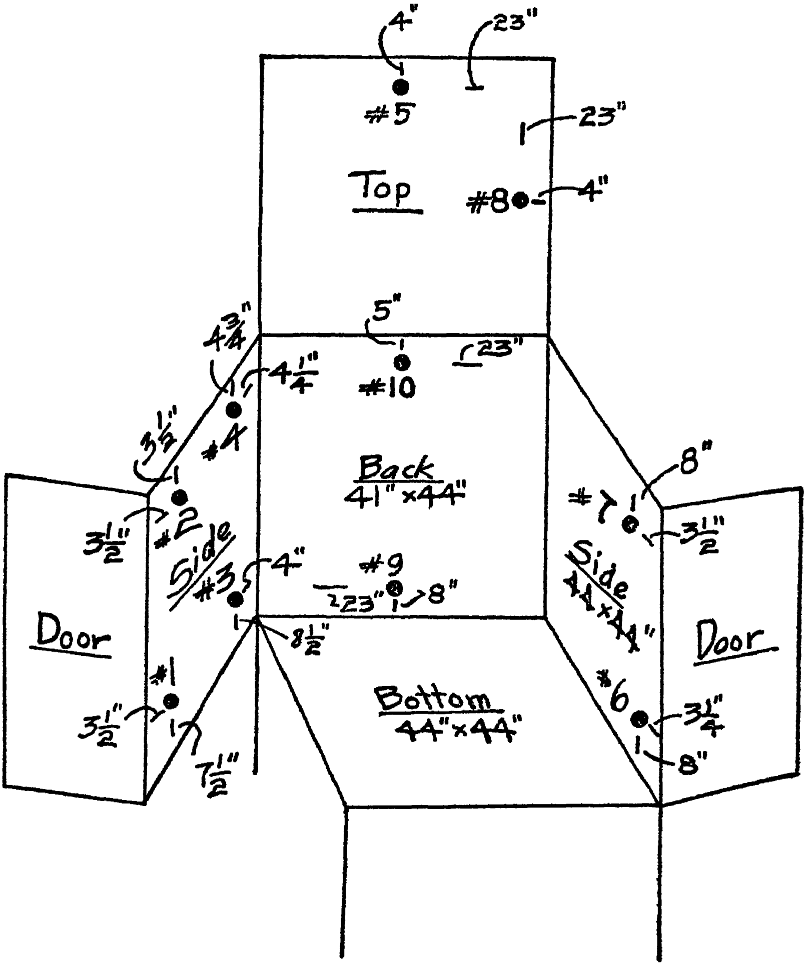


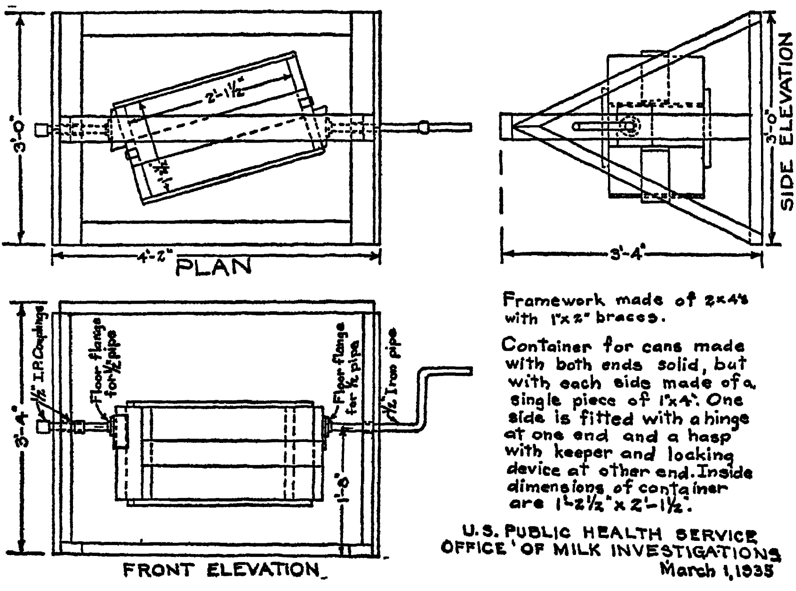
FIGURE 4.—Thermometer locations.

(3) All of the cans were then inoculated by rinsing them thoroughly with 1,000 cc of a water suspension of the test organism, prepared as previously described. This concentration was found necessary in order that there might remain a measurable final count after heat treatment, as otherwise the time and temperature combinations at which the assumed standard of 99.99 percent reduction was achieved could not be computed.

(4) The inoculated cans were inverted on a rack and allowed to drain for about 10 minutes.

(5) After draining, 1 or 2 of the inoculated cans were each rinsed with 500 cc of sterile water to determine the average initial contamination. The rinsing was done by means of a mechanical shaker. The shaking action was standardized at 100 revolutions made at the rate of 1 per second.

(6) All of the cans with their covers were then placed in an inverted position in the hot-air cabinet as shown in fig. 1. Except for the moisture in the culture on the inside of the can no water was used in connection with these tests; that is, no water was placed in the hot-air cabinet nor on the outside of the can. This was considered important on the assumption that increasing humidity decreases the thermal resistance of an organism for any given time and temperature combination. Had auxiliary moisture been used in these tests the necessary time and temperature combination thus determined would not have been applicable to the use of cabinets in which water was not introduced and it is believed that many such cases will arise in the wide commercial use of hot-air cabinets.



Framework made of 2×4's with 1"×2" braces.

Container for cans made with both ends solid, but with each side made of a single piece of 1"×4". One side is fitted with a hinge at one end and a hasp with keeper and locking device at other end. Inside dimensions of container are 1'-2½"×2'-1½".

U.S. PUBLIC HEALTH SERVICE
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March 1, 1935

FIGURE 5.—Mechanical shaker for milk cans.

(7) The cabinet was then heated to approximately the test temperature. The heat source intensity used was one which would give a heating period of approximately 30 minutes, the range actually being 26 to 39 minutes. A holding period of 10 minutes was used at all temperatures tested.

Immediately at the end of the holding period the cans were removed from the cabinet and allowed to cool for 30 minutes at atmospheric temperature.

(8) After cooling, each of the inoculated cans was rinsed with 500 cc of sterile water by means of the previously described shaker in order to determine the percentage reduction of the test organism which had resulted from the heat treatment.

RESULTS

Number of runs.—Twenty runs were made in all, 5 at each of 4 test temperature groups.

Initial contamination.—The initial contamination varied from 18,000 per cc of can capacity to 70,000. The mean initial contamination for each of the 4 temperature groups varied from 42,000 per cc of can capacity for the 173.4° F. and the 184.7° F. temperature groups to 51,000 for the 163.5° temperature group. It was attempted to hold the variations down as far as possible, since extreme variations of the initial contamination would affect the results.

Heating period.—The time required to bring the cabinet to the test temperature varied from 26 to 39 minutes. The mean heating time for the various temperature groups, however, varied only from 28 minutes and 24 seconds for the 173.4° F. group to 34 minutes and 39 seconds for the 184.7° group. It was attempted to hold down as far as possible the variations in heating time, since the heating period obviously contributes to the total lethal effect and great differences in heating time would affect the results.

Mean temperatures during holding period.—The mean temperatures for the four temperature groups were 154.5° F., 163.5° F., 173.4° F., and 184.7° F. These four temperature groups were obtained by so operating the cabinet that the thermometer at the coldest point showed at least 150°, 160°, 170°, and 180° F., respectively.

Temperature deviations during the holding period.—The maximum deviation from the mean temperature at the start of the holding period varied from 1.5° F. to 26° F.

The maximum deviation from the mean temperature at the end of the holding period varied from 1° F. to 8° F.

In order to give a better indication of the true degree of dispersion of the temperature during the holding period, there was computed for each run and for each group of runs the probable error of the individual temperatures. The probable error ranged from ±2.6° F. for the 173.4° group of runs to ±3.6° F. for the 154.5° group of runs. This indicates that most of the temperatures throughout each of the 4 groups of runs were relatively close to the mean for the group.

Bactericidal effect.—The mean bactericidal reduction for the 4 groups ranged from 99.9372 percent at 154.5° F. to 99.9987 percent at

184.7° F. The mean residual count varied from 30 per cc of can capacity at a mean temperature of 154.5° F. to 0.57 per cc of can capacity at a mean temperature of 184.7° F.

These residual counts should not be compared with the residual total counts remaining from the commercial washing and sterilizing of cans.

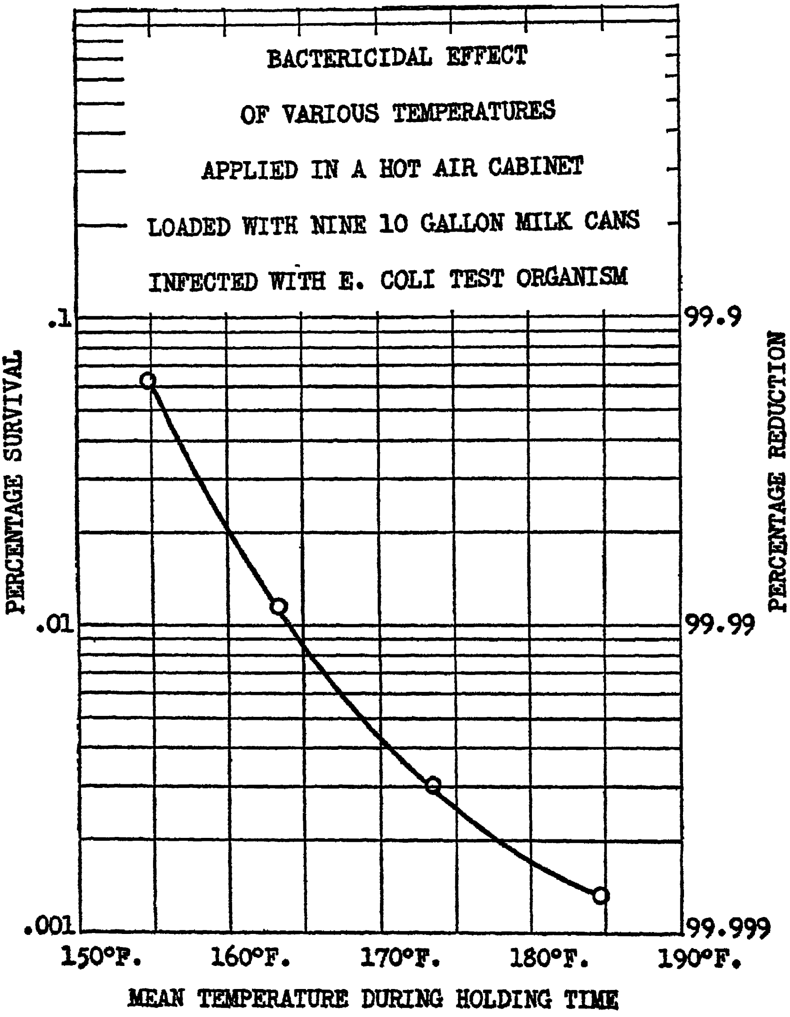

FIGURE 6.—Bactericidal effect of various temperatures.

Such cans are contaminated with an indefinite "run of the mill" flora of highly fluctuating thermal resistance, whereas the present work was done with a pure culture selected specifically for its heat resistance.

Nor should the residual counts determined in these tests be compared with the present standard of 1 per cc capacity recommended by the United States Public Health Service Milk Code as a criterion for washing and sterilization. In the present experimental work the cans were not washed between contamination and bactericidal treatment. Had they been washed after contamination the count would obviously have been much lower For reasons given earlier in this report, it is not considered that residual counts from "run of the mill" flora offer a dependable criterion of bactericidal treatment.

The mean percentages of bacterial reduction observed in these runs have been plotted against the mean temperatures for each of the four temperature groups on the accompanying graph. It will be observed that the points form a smooth curve and that the curve passes through the 99.99 percent reduction level at 164° F.

SUMMARY AND CONCLUSIONS

(1) Studies were made of a 46-cubic foot hot-air cabinet, equipped with 2 gasoline burners and a 16-inch fan, and loaded with 9 milk cans, to determine the time and temperature necessary to produce satisfactory bactericidal treatment of milk cans by means of hot air which has not been humidified.

(2) The organism used in making the tests was a pure culture of a strain of *E. coli* isolated specifically for use as a test organism. Its thermal resistance is higher than that of the most heat-resistant milk-borne pathogen. In milk at 140° F. an exposure of 51 minutes is required to devitalize it, whereas practically all authorities agree that in milk at this temperature a 30-minute exposure is sufficient to devitalize the most heat-resistant milk-borne pathogen. When cultured as previously described and then suspended in distilled water buffered at pH 7.2 with phosphate buffers, a 99.99 percent reduction of the criterion organism was obtained in about 33 minutes at 140° F.

(3) The cans were rinsed with a buffered distilled water suspension containing approximately 500,000,000 of the test organisms per cc, which produced a mean contamination of approximately 40,000 to 50,000 organisms per cc of can capacity.

(4) Four different temperatures, namely, 154.5°, 163.5°, 173.4°, and 184.7° F., were studied, using a mean heating time of about 30 minutes, a holding time of 10 minutes, and a cooling time of 30 minutes.

(5) The use of the fan kept the deviations in temperature in the cabinet within a probable error of about 3° F.

(6) Under the above conditions a percentage killing of 99.99 percent was produced at 164° F.

(7) It is concluded that if hot air cabinets are operated so that the coldest portion remains at at least 180° F. for at least 20 minutes milk cans contained therein will be subjected to adequate bactericidal treatment.

(8) Such a time and temperature combination would provide at least a 16° F. plus a 10 minute margin of safety.

REFERENCES

(*1*) Park, W. H.: Thermal death points of pathogenic bacteria in milk. Am. J. Pub. Health, *17:* 36 (January 1927).

(*2*) Park, W. H.: Thermal death point of streptococci. Am. J. Pub. Health, *17:* 710 (June 1928).

TOXICOLOGY OF PHENYLDICHLORARSINE

I. EXPERIMENTS WITH ANIMALS[1]

By H. C. Dudley, *Associate Biochemist*, and B. F. Jones, *Passed Assistant Surgeon, United States Public Health Service*

The use of phenyldichlorarsine (commonly abbreviated PDA) approximately 1 percent by weight in medium and heavy petroleum distillates, as a wood preservative has undergone laboratory and general service tests. Experimental studies indicate that mixtures of this type are efficient wood preservatives because of the fungicidal properties of the arsenical compounds present (*1, 2, 3*). The introduction of PDA-oil mixtures in processes or adaptations of processes commonly employed in wood preservation will create many possibilities of personal contact with these materials.

The purpose of this series of papers is to show the effects of exposure to phenyldichlorarsine (*a*) in the vapor phase, (*b*) in the liquid phase, and (*c*) when mixed with certain petroleum oils. The part of the investigation reported at this time deals with the response of experimental animals to exposure of PDA in various ways and circumstances.

Because of its toxic properties, PDA was used as a chemical agent during the World War, but never to any great extent. For the most part, PDA was used as an artillery shell filling, admixed with other agents (*4*). Certain studies made of the toxic and vesicant properties of PDA by the Chemical Warfare Service, United States Army, have been reported by Hanzlik and Tarr (*5*). These authors class PDA as a severe irritant which produced hyperemia, swelling, and edema, ulceration, necrosis, and similar conditions, on dog's skin, together with vesication on human skin. They draw the following conclusions as the result of their investigations:

> As a rule the active arsenicals acted more severely than dichlordiethyl sulfide (mustard gas) during the acute stages. The lesions were more pronounced, painful, indurated, and attached. The ulcers were sharply punched out, clean, dry, and possessed red bases. Healing occurred promptly. The differences between the different arsenicals were principally quantitative. The order of skin irritant efficiency, in descending order, is dichlordiethyl sulfide (mustard gas), phenyldichlorarsine (PDA), and methyl dichlorarsine. The arsenicals are efficient

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[1] From the Division of Industrial Hygiene, National Institute of Health.

protein precipitants, unlike dichlordiethyl sulfide, indicating a different type of reaction. The arsenicals produce a deep brown pigmentation of the affected areas.

Flury (*11*) places the intolerable concentration for man, i. e., that concentration in which it is impossible to remain for more than 1 minute, at 10 cubic millimeters of liquid PDA per cubic meter, corresponding to 0.0164 mg per liter of air. The same author gives 1:500,000 in water as a lethal concentration of PDA for fish (bitterling and minnows) and a concentration of 1:50,000 as lethal to trypanosomes at 37° C. Other related organic arsenic compounds were found to be highly toxic to insects, paramecia, and even to plants.

Phenyldichlorarsine, PDA, C_6H_5–As–Cl_2, when pure, is an oily liquid of low viscosity, colorless to pale straw color; molecular weight, 222.9; soluble in ether, alcohol, acetone, and petroleum distillates; very slightly soluble in water; vapor pressure, 0.035 mm Hg at 25° C.; boiling point, 255°–257° C.; specific gravity, 1.64; vapor density, 7.75; saturated concentration in air at 20° C., 404 mg/m^3; intolerable concentration, 16 mg/m^3; is stable in presence of oxygen (*4, 7, 8, 9*). There seems to be some disagreement among certain authors as to the rapidity and the products of hydrolysis. Roeder and Blasi (*6*) state that PDA hydrolyzes to phenyl arsonic acid, C_6H_5–AsO $(OH)_2$. Hanslian (*4*) indicates that decomposition occurs in water and that the products of decomposition are toxic. In a review of organic arsenicals, Raiziss and Gavron (*10*, p. 115) state that PDA is unaffected by hot or cold water. Additional investigation seems necessary to clear up this point of importance in relation to the effects of weathering on wood products treated with the PDA-oil mixtures.

A. INHALATION TESTS

1. PDA VAPOR

A small constant-flow chamber set-up was used to expose guinea pigs for 10 and 30 minutes to various PDA-air mixtures, in concentrations ranging from 0.10 mg PDA/liter to 0.40 mg PDA/liter. The air-PDA vapor mixture of various concentrations was prepared by passing a stream of air through bubblers containing liquid PDA. The air stream saturated with PDA vapor was then mixed in varying proportions with a stream of fresh air and led into the chamber. Samples were drawn from the chamber by means of a calibrated flowmeter. The PDA in the air sample was absorbed in soda lime tubes, the contents of these tubes were dissolved in hydrochloric acid, and the quantity of PDA present was estimated from an aliquot sample by means of the modified Gutzeit method. Standards were prepared as described later under a description of vapor tests with PDA-oil mixtures.

Exposures of guinea pigs were made to a graded series of PDA-air mixtures. Ten guinea pigs at a time were exposed to each concentration. The animals were observed during the experiment and for a period of 20 days following exposure for the effects of the PDA. Symptoms were noted and deaths were tabulated by 24-hour intervals.

Analysis of the phenyldichlorarsine used in this series of experiments showed As 32.88 percent, Cl 31.18 percent. Although this analysis indicates a purity of 98 percent, the probable presence of $AsCl_3$ as a contaminant makes this analysis misleading. By means of fractional distillation, the purity of the sample was estimated at 93 to 95 percent PDA.

In table 1 are shown the results of the exposure of guinea pigs to vapors of PDA in concentrations of 0.10 to 0.40 mg PDA/liter, for 10 and 30 minutes. These results indicated that PDA vapor is but slightly toxic for guinea pigs on short exposure, that is, for exposures of 10 minutes or less. For longer exposures the toxic action is more pronounced. In evaluating the toxicity data shown, it must be kept in mind that the vapors of PDA are extremely irritating. In all cases the eyes and nose of the animal gave evidence of severe irritation. This effect had cleared within 3 to 5 days.

TABLE 1.—*Mortality of guinea pigs exposed to PDA vapors*

Concentration mg PDA per liter	Length of exposure (minutes)	Number of animals exposed	Deaths, in days				Percent dying in 20 days
			1 to 5	6 to 10	11 to 15	16 to 20	
Controls	----------	10	0	1	0	0	10
0.10	10	10	1	0	0	0	10
.37	10	10	2	0	0	0	20
.41	10	10	1	0	1	0	20
.40	10	10	1	1	0	0	20
.40	30	10	3	1	0	0	40

Prentiss (*9*, p. 165) states:

> While the primary physiological effect of phenyldichlorarsine on men and animals is injury to the lungs and death is usually caused by pulmonary edema, phenyldichlorarsine also has a marked vesicant as well as a sternutatory effect on the upper respiratory passages. Its toxicity exceeds that of phosgene, a concentration of 0.26 mg per liter being fatal in 10 minutes; its vesicant action is somewhat slower than that of mustard gas and the resulting wounds as a rule heal more rapidly.

Prentiss does not state the experimental basis for the minimum lethal concentration of 0.26 mg PDA/liter, nor what animals were used in the toxicity tests (presumably mice). From the results obtained by the present authors, and reported herein, it would appear that the lethal properties of PDA in the vapor phase have heretofore been somewhat overestimated. It is true, however, that the vapor is extremely irritating to the eyes and nasal passages.

2. PDA-OIL VAPORS

In order to determine the effect of oil-PDA vapors at room temperature, rabbits were exposed for 2- and 4-hour periods to the vapors derived from oil mixtures containing 1 percent PDA.

Three rabbits in each experiment were placed in mesh wire cages inside a cubical fiberboard chamber, volume 8 cubic feet, and a stream of the oil-PDA vapor was passed through the chamber at approximately 4 liters per minute. A small electric fan was placed in the chamber so as to give complete mixing of the vapor stream and the chamber atmosphere. The air stream before entering the chamber was bubbled through a large capacity bubbler containing 1 percent PDA-oil mixture. The bubbler was kept in a water bath, temperature 40°–50° C. On leaving the bubbler, the air stream passed through a water-cooled reflux condenser attached so as to return all condensate to the bubbler. The temperature of the air stream as it entered the chamber was 23°–25° C. By this procedure a saturated atmosphere, at room temperature, of the vapor was secured. Since there was no cooling effect inside the chamber, and the oil and PDA were in a true gaseous phase, no mist or fog was formed, nor was there any condensation on the cage or walls of the chamber.

In exposing the animals by the above procedure, it was possible to determine the effects of the greatest possible true gaseous concentration of PDA obtainable from oils of the character tested, at temperatures of 23°–25° C.

In order to determine analytically the concentration of PDA to which the animals had been exposed, the procedure described below was followed:

A metered flow of air was forced through the bubbler set-up, as previously described, at the rate of 3.82 liters per minute. The air stream was then cooled by the reflux condenser and passed into a soda-lime absorption tube. The amount of arsenic in this tube was determined by the modified Gutzeit method. Standards for comparison were prepared by absorbing weighed amounts of PDA in identical absorption tubes. Since the same lots of reagents in equal quantities were used in preparing the standards and in the analytical determination, no blank correction was needed.

The animals used were normal albino rabbits. A small area about 3 inches by 2 inches on the back of each animal was clipped free from hair. These areas were observed for any skin effects due to exposure to the oil-PDA vapor. The eyes and nostrils were examined in order to determine the effects of exposure on these organs.

In table 2 are shown the results of the oil-PDA vapor tests. These results indicate that saturated PDA-oil vapors arising from 1 percent PDA solutions at ordinary temperatures are but slightly irritant and do not present a serious hazard on acute exposure. It must be pointed out, however, that supersaturated vapors will produce mists or fogs, which, on condensation, may produce the effects shown by skin and eye application of the PDA-oil mixtures.

TABLE 2.—*Effects of oil-PDA vapors on rabbits*

VAPORS FROM 1 PERCENT PDA IN OIL NO. 208

Animal	Concentration PDA mg/l	Length of exposure	Symptoms
		Hours	
Rabbit No 1	0.013	2	Negative.
Rabbit No 2	.013	2	Slight erythema of skin area immediately after test. No redness after 24 hours. Other symptoms negative.
Rabbit No 3	.013	2	Negative.
Rabbit No 4	.013	4	Slight erythema of skin area immediately after test. Slight conjunctivitis in 24 hours. Clear at 48 hours.
Rabbit No 5	.013	4	Slight conjunctivitis in 24 hours. Clear at 48 hours.
Rabbit No 6	.013	4	Do.
VAPORS FROM 1-PERCENT PDA IN OIL NO. 1608			
Rabbit No 7	0.015		Negative.
Rabbit No. 8	.015		Very slight conjunctivitis at end of 24 hours Slight redness on skin area, 24 hours Clear at end of 48 hours.
Rabbit No. 9	.015		Very slight conjunctivitis at end of 24 hours. Clear at end of 48 hours.

NOTE —No general systemic effects were noted in any of the animals exposed in the above tests No deaths occurred as the result of these exposure tests When rabbits were exposed for 4 hours to vapors of the oils (No. 208 and No 1608) under the same conditions as that of the previous experiments, no eye or skin irritation was noted.

B. APPLICATION OF LIQUID PDA TO THE SKIN

In order to determine the action of PDA when the undiluted material is applied to the skin, measured amounts of the liquid were applied to shaved areas on the backs of normal rabbits. The rabbits were placed in a stock which prevented the animal from contaminating the laboratory equipment and partially removing or spreading the PDA. After application of the PDA to the back of the rabbit, the animals were allowed to remain in the stocks for a period of 2 hours in order to allow time for absorption of the material. Animals were then placed in individual cages for observation. The amount of PDA applied to the rabbits was measured by means of calibrated capillary pipettes delivering 0.10 and 0.01 cc. The specific gravity of PDA, 1.64, was used in calculating the toxicity values expressed in milligrams of PDA per kilogram of body weight.

In table 3 are shown the results of toxicity tests made with measured quantities of liquid undiluted PDA when applied to clipped areas on the backs of normal rabbits.

On gross pathological examination of the animals which died in this series of experiments, the significant abnormalities noted were pulmonary congestion and, in some cases, marked lung edema with considerable cardiac dilatation. The results of microscopic examination of tissues will be reported at a later date.

TABLE 3.—*Results of application of undiluted PDA to skin of rabbits*

Weight of rabbit (grams)	PDA applied	Mg PDA per kilo [1]	Results	Weight of rabbit (grams)	PDA applied	Mg PDA per kilo [1]	Results
	Cc				*Cc*		
2,408	0.15	102	Dead in 3½ hours.	2,793	.02	11.7	Dead in 3 days.
2,347	.10	70	Dead in 3 hours.	2,856	.02	11.4	Dead in 2 days.
3,181	.10	51	Do.	1,484	.01	11.0	Dead in 4 days.
2,232	.05	37	Dead in 15 hours.	3,043	.02	10.7	Dead in 10 days.
2,215	.04	29.6	Dead in 20 hours.	3,108	.02	10.5	Survived, severe burn.
2,533	.03	10.4	Dead in 2 days.	3,341	.02	9.8	Dead in 3 days.
1,913	.02	17.1	Do.	1,788	.01	9.2	Dead in 2 days.
3,424	.03	14.4	Dead in 20 hours.	1,836	.01	8.9	Survived, severe burn.
1,185	.01	13.8	Dead in 3 days.	3,750	.02	8.7	Dead in 20 hours.
1,388	.01	11.9	Dead in 2 days.	2,814	.01	5.8	Survived, severe burn.

[1] Calculated from density, 1.64.

The course of the burns resulting from the skin applications as shown in table 3 may be summarized in the following manner:

15 minutes after application	Blanching at site of application. Erythema in surrounding area.
1 hour after application	Wheal around depressed site of application.
2 hours after application	General swelling. Central lesion, flat, depressed; "punched out."
24 hours after application	General severe swelling and edema.
48 hours after application	Swelling subsiding. No exudate.
5 days after application	Swelling subsided. Area of original swelling colored yellow. Area of application very dry and hard.
10 days after application	Healing well progressed. Entire area yellowish and central area very hard. Firmly attached.
20 days after application	Do.
30 days after application	Do.

C. VESICANT PROPERTIES OF PDA IN OIL MIXTURES

The oils used for these tests were petroleum distillates. Oil No. 208, a gas oil, flash point (open cup), 150° F.; Robinson color No. 8; Saybolt universal viscosity at 100° F., 35–45; final boiling point, 725° F.

Oil No. 1608, a fuel oil, flash point (open cup), 325–340° F.; gravity (A. P. I.), 19.5–21.5; Robinson color, black; Saybolt universal viscosity at 100° F., 700–725, at 210° F., 60–65.

Solutions of PDA, 0.01 percent, 0.1 percent, and 1 percent by weight in each oil were made by adding measured amounts of PDA to known weights of the oil.

The shaved belly of the rabbit on test was marked off in eight equal squares, using an indelible pencil to define the areas. To each of these areas a small drop of the oil or oil-PDA mixture under test (approximately 0.02 cc) was applied. Two areas were then treated with the 0.01 percent of PDA-oil mixture. In the same manner, the 0.1 percent and 1 percent of PDA-oil mixtures were applied. The animals being held were allowed to remain in this position for 1 hour to allow the oil to spread and prevent excessive loss when replacing the rabbit in the cages. In order to prevent contamination of each other, the animals were placed in separate cages. Two rabbits were used for each type of oil, making a total of four areas tested for each oil-PDA combination and concentration. The effects of the oils and oil-PDA mixtures were noted daily.

In table 4 are shown the results of vesicant tests using PDA-oil mixtures containing 0.01 percent, 0.1 percent, and 1 percent PDA. These results show conclusively that 1 percent PDA mixtures with oils of this type are powerful vesicants for rabbits.

TABLE 4.—*Vesicant action of 0.02 cc oil-PDA mixtures when applied to shaved belly of rabbit*

Subject	Percent PDA in mixture	Observations after application			
		24 hours	48 hours	72 hours	96 hours
		OIL NO. 208+PDA			
Rabbit No. 1.	1.0	Induration with definite scab formation.	Scab formation unchanged, a large white area of swelling and induration surrounding scab.	Area slowly healing, swelling less. Thin scab formation.	Swelling subsided; scab formation over entire area of swelling.
	.1	(1)	(1)	(1)	(1).
	.01	(1)	(1)	(1)	(1).
Rabbit No. 2.	1.0	Induration of skin.	Blanched area, with swelling.	Slight swelling with scab formation.	No swelling, with thick scab formation.
	.1	(1)	(1)	(1)	(1).
	.01	(1)	(1)	(1)	(1).
		OIL NO. 1608+PDA			
Rabbit No. 3.	1.0	Hardening and thickening of skin.	Large thin scab, with swelling.	Swelling subsiding, thick scab.	Same as third day.
	.1	(1)	(1)	(1)	(1).
	.01	(1)	(1)	(1)	(1).
Rabbit No. 4.	1.0	Induration with definite scab formation.	Marked swelling, with thick scab.	General healing; heavy scab, swelling subsiding.	Same as third day.
	.1	(1)	(1)	(1)	(1).
	.01	(1)	(1)	(1)	(1).

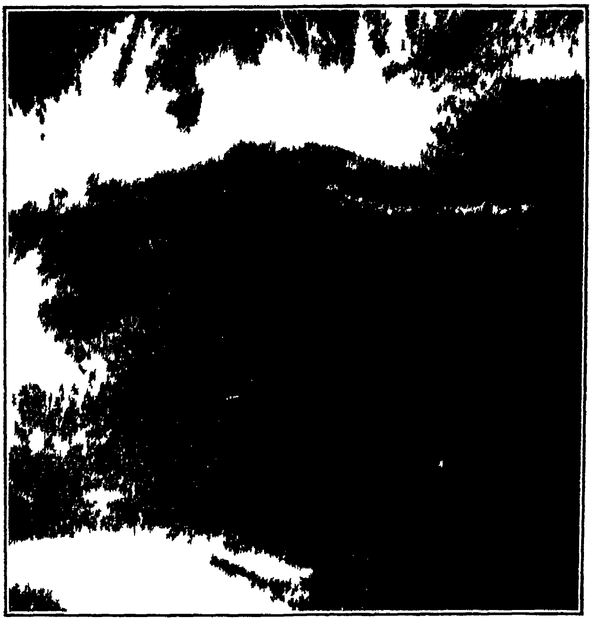
[1] No reaction.

Healing of the affected areas began after the third day and was complete in 20-25 days. No systemic effects were noted. In no case did open ulcers or slough occur; scab formation followed gradual weeping of affected areas. As healing progressed the areas of application became indurated and adherent to the subcutaneous tissue.

Note photographs taken on fifth day after application 1 percent PDA in oil; rabbits Nos. 1 and 4.

On a second series of skin tests with rabbits, the 1-percent PDA-oil mixtures gave results identical with those shown in table 4. Controls

Rabbit No. 1.—1.0 percent PDA in oil No. 208. Scab formation 5 days after application on clipped belly of rabbit. (Approx. × 1.)



Rabbit No. 4.—1.0 percent PDA in oil No. 1608. Scab formation 4 days after application on clipped belly of rabbit. (Approx. × 1.)

of coal-tar creosote were used in order to show the relative irritant qualities of the creosote and oil-PDA mixtures. The creosote, on skin application to rabbits, gave slight irritation which cleared in 48 hours.

Vesicant tests were made with commercially prepared PDA-oil mixtures containing 0.06 pound PDA per gallon (approximately 0.75 percent by weight PDA). Rabbits were used for these tests as described above. The commercially-prepared oil mixtures, made from oil No. 208 and oil No. 1608, showed vesicant properties practically identical to the mixtures prepared in this laboratory, containing 1 percent by weight PDA. Commercial oil mixtures which had been used in wood-treating processes (hot pressure process) produced the same skin reactions as the unused commercial mixtures.

Wood samples treated with the commercially prepared oil mixtures were examined and tested. The wood samples treated with the PDA in gas oil (No. 208) had no excess oil remaining on the surface of the wood. In the case of the wood samples treated with the fuel oil mixture (No. 1608), a rather large amount of the oil mixture adhered to the surface of the wood. When this oil was scraped off and applied to the skin of rabbits, burns resulted very similar to those described previously for the 1-percent PDA in oil No. 1608. (See table 4.) Wood samples treated with PDA fuel-oil mixtures were allowed to weather for 3 weeks on the roof of a building. The excess surface oil obtained from these samples when applied to the skin of rabbits produced but slight irritation.

The fuel oil (No. 1608) used in making PDA-fuel oil mixtures is of such high viscosity that a considerable excess of the mixture remains on the surface of treated wood after drainage. In the case of the gas oil (No. 208), the viscosity at ordinary temperatures is such that complete surface drainage is accomplished.

Wood chips, free from adhering surface oil, were cut from the weathered and unweathered wood samples and taped to clipped areas on the backs of albino rabbits. Although these wood chips were well impregnated by the oil mixtures, no skin irritation resulted from this treatment after the wood had been in close contact with the skin for 4 hours.

In order to determine the further effects of PDA in the oil mixtures, the eyes of rabbits were treated with 0.5 percent PDA-oil mixtures. As a control, to the right eyeball of the rabbit 0.02 cc of the oil was applied. To the left eyeball, 0.02 cc of the 0.5 percent PDA-oil mixture was applied. The effects were noted as to severity and duration.

In table 5 are shown the results of vesicant tests obtained when 0.5 percent PDA-oil mixtures were applied to the eyes of rabbits.

These results show that a concentration of 0.5 percent by weight PDA in mineral oils is extremely irritating to the eyes of rabbits.

TABLE 5.—*Action of 0.5 percent PDA in oil when applied to eye of rabbit—(0.02 cc applied to eyeball)*

Oil	Subject	Eye	Observations after application				
			24 hours	48 hours	72 hours	96 hours	120 hours
Oil No 208.	Rabbit No. 5.	Right; oil No. 208.	(1)	(1)	(1)	(1)	(1).
		Left, oil plus 0.5 percent PDA.	Swelling, acute conjunctivitis.	No swelling, slight conjunctivitis.	No conjunctivitis. Eye clear.	Normal	Normal.
Oil No 1608.	Rabbit No. 6.	Right; oil No. 1608.	(1)	(1)	(1)	(1)	(1).
		Left, oil plus 0 5 percent PDA.	Swelling, acute conjunctivitis.	Same as at 24 hours.	Swelling subsided, acute conjunctivitis.	Same as at 72 hours.	Same as at 96 hours.

[1] No reaction.

NOTE.—Rabbit No. 6 suffered secondary infection in the eye treated with the PDA-oil mixture, with death resulting 15 days after treatment.

DISCUSSION

Flury and his collaborators (*11*) investigated several hundred organic arsenical compounds, including PDA and diphenylchloroarsine (DA). From their work it is obvious that these compounds are powerful general protoplasmic poisons whose systemic and local actions as a group are similar. Flury traces the toxic action to destruction of enzymes, particularly catalase and the oxidative enzymes of the cell. He attributes the local irritant action to the production of arsenious acid and its prolongation to the splitting off of arsenic. This effect is considered to be specific and not due to change in pH from appearance of acid ions.

It is interesting to note that this author reports the development of lung edema in cats after subcutaneous injection of 1 mg per kilo body weight of diphenylchloroarsine under circumstances precluding the possibility of inhalation of vapor. This agrees with our own experience in some cases when PDA was applied in minimal lethal dosage to the skin of rabbits without possibility of inhalation of vapor. Further experiments to test the influence of the vagus in the production of this edema are needed. Flury attributes the edema to injury to the capillaries of the lungs rather than to general circulatory failure.

SUMMARY

The projected use of phenyldichlorarsine (PDA), approximately 1 percent by weight, in medium and heavy petroleum distillates, as wood preservative mixtures, necessitates studies on the toxic and vesicant action of phenyldichlorarsine.

The minimum lethal concentration of PDA for guinea pigs, 10- to 30-minute exposure, is greater than 0.40 mg/liter, the saturation concentration at 25° C. Liquid PDA produces intense and fatal burns on normal rabbits when applied to the skin in amounts less than 0.02 cc. Calculated on a weight basis, the minimum lethal dose for rabbits, by skin application is 8–10 mg per kilogram of body weight.

When PDA is mixed with medium and heavy petroleum distillates in concentrations of 1 percent by weight, the resulting mixture is extremely vesicant and approximately 0.02 cc will produce burns on rabbits. In general, the heavy, more viscous oil produced the more severe burns. The heavy oil tended to localize the burn, giving a small but more severe reaction. The lighter oil gave a burn of less intensity but covering a greater area.

Excess oil remaining on the surface of wood samples freshly treated with PDA-oil mixtures produced marked irritation when applied to the skin of rabbits. Weathering of such treated wood samples for 3 weeks greatly reduced the irritating action of the surface oil.

When well-impregnated wood samples, wiped free from excess surface oil, were placed in contact with the skin of rabbits for 4 hours, no irritation resulted.

The experiments reported in this paper deal only with the effects of acute exposure to PDA. In addition to acute effects, the possibility of chronic intoxication from the original irritant material, arsenic, and other arsenic derivatives must be considered.

REFERENCES

(*1*) Atwood, W. G., and Johnson, A. A.: Marine structures, their deterioration and preservation. National Research Council (1924).

(*2*) McQuaid, Howard S.: U. S. Patent No. 1758958. May 20, 1930. Wood preservative. (Assigned to Harold W. Walker.)

(*3*) Walker, H. W., McQuaid, H. S., Allen, M. S., and Carter, R. H.: Chemical Warfare Service. Marine Piling Investigation. Bulletin of American Railway Engineering Association, **28:** No. 290, p. 17 (October 1926).

(*4*) Hanslian, Rudolph: Der Chemische Krieg. Vol. I. E. S. Mittler and Sons, Berlin (1937).

(*5*) Hanzlik, P. J., and Tarr, Jesse: The comparative skin irritant properties of dichlordiethyl sulfide and other agents. J. Pharm. and Exp. Therap., **14:** 221 (1919).

(*6*) Roeder, G., and Blasi, Nicoli: New Arsenation of Organic Compounds. Berichte Deut. Chem. Gesell., **47:** 2748 (1914).

(*7*) Baxter, G. P., Bezzenberger, F. K., and Wilson, C. H.: The vapor pressure of certain substances, etc. J. Am. Chem. Soc., **42:** 1386 (1920).

(*8*) Blicke, F. F., and Smyth, F. D.: The properties of certain organic arsenicals. J. Am. Chem. Soc., **52:** 2946 (1930).

(*9*) Prentiss, A. M.: Chemicals in war. McGraw-Hill Book Company, New York (1937).

(*10*) Raiziss, G. W., and Gavron, J. L.: Organic arsenical compounds. A. C. S. Monograph No. 15. Chemical Catalog Company, New York (1923).

(*11*) Flury F.: Über Kampfgasvergiftungen. IX. Lokal Reizende Arsenverbindungen. Zeitschrift fur die Gesamte Experimentelle Medizin, **13:** 523 (1921).

A MODIFIED CELL FOR DUST COUNTING

By Charles E. Couchman, *Inspector of Industrial Hygiene,* and Wilmer H. Schulze, *Director of the Bureau of Environmental Hygiene, Baltimore City Health Department*

The Greenburg-Smith impinger (*1*) and Sedgwick-Rafter counting cells are generally recognized as standard equipment for evaluating the extent of dust exposures in industrial occupations. While the basic principles of the impinger have remained unchanged, several modifications have served to provide an apparatus of more rugged character and, hence, more adaptable to general field use. The Sedgwick-Rafter counting cell is used for the quantification of the dust collected with the impinger equipment. This cell, originally designed for making microscopical studies of water supplies, has certain disadvantages when used for studying industrial dusts. From our experience these may be enumerated as follows:

1. The edges and corners formed by the cell walls make it difficult to remove all dust particles during cleaning.
2. Through usage the bottom of the cell may become scratched to the extent that it interferes with the accurate counting of dust particles.
3. A water-alcohol mixture, used for the collection of types of dust which tend to clump in water alone (*2*), acts as a solvent on the cement which holds the cell walls in place, thus necessitating recementing or replacement.
4. Recementing the cell walls may entail an appreciable error in the depth of the cell, hence a resultant error in the dust count. Although this discrepancy may be of little significance in comparison with others introduced in the sampling technique, its elimination does improve the accuracy of the procedure.
5. The solvent effect on the cement of oils used as media for comparing the refractive indices of dust particles makes it impractical to use the Sedgwick-Rafter cell for this purpose (*3*).
6. The amount of breakage of cells is increased by its all-glass construction.

The extensive use of dust-counting cells in the field of industrial hygiene led to the construction of a cell which eliminates the disadvantages entailed in the Sedgwick-Rafter unit. Figure 1 is a photograph of an assembled modified cell which we have found to equal in accuracy the Sedgwick-Rafter cell and to offer distinct advantages over the latter unit. A circular glass disk is held between two threaded circular metal frames. The upper frame has a central circular opening $1\frac{13}{32}$ inches (35.6 mm) in diameter and is machined to 0.039 inch (1 mm) thickness. The accuracy of the cell is dependent upon the latter dimension, and this is the only measurement of prime importance.

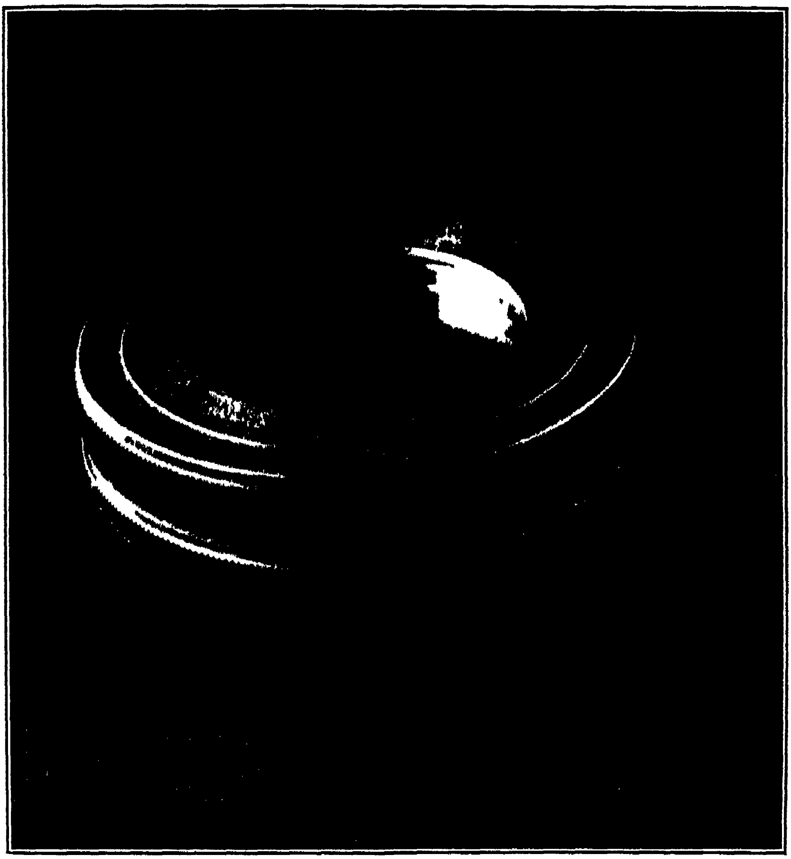


FIGURE 1.—Assembled modified cell.

The other dimensions given in the cross-section view of the cell in figure 2 need only be approximate.

The circular glass disks, one being used as a cover glass for the cell and one serving as the bottom of the cell, should be of good optical quality, equal to that used by goggle manufacturers. We have found goggle disks, free from distortion and scratches, to answer the purpose very satisfactorily. Disks with parallel surfaces must be used, since curved surfaces will vary the required 1 mm depth throughout the cell. Table 1 shows the comparison of the depths of several Sedgwick-Rafter cells with the modified cell in which goggle disks from two manufacturers were used. Columns 4 and 5 show the errors which may result in recementing the walls of Sedgwick-Rafter cells in the laboratory. It is apparent that the accuracy in the depth of the modified cell is equivalent to those of the Sedgwick-Rafter cells into which no error has been introduced by recementing. Measurements were made with a micrometer depth gage graduated into thousandths of an inch and estimated to the quarter of a thousandth. Similar results of depth measurements in Sedgwick-Rafter cells, both new and recemented, were obtained by an interested worker in another laboratory.

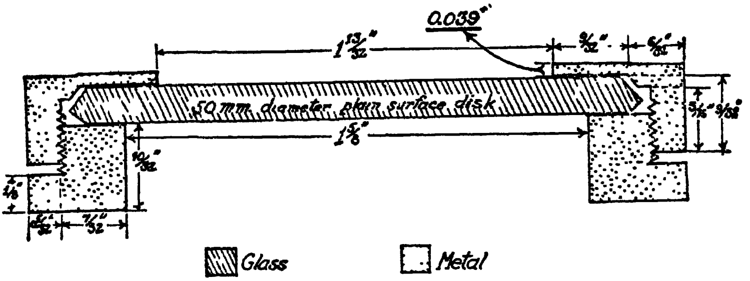


FIGURE 2.—Cross-section of circular dust cell.

TABLE 1.—*Measurement of depths of dust-counting cells*

(1 mm=0.03937 inch)

	Sedgwick-Rafter cells					Modified cell goggle disks	
	1	2	3	4[1]	5[1]	6	7
Average of 10 readings (in thousandths of an inch)	39.73	39.50	39.40	36.80	38.18	39.55	39.40
Percent error	+0.9	+0.3	0	−6.3	−3.0	+0.5	0
Greatest deviation	0.75	0.50	0.50	5.25	5.50	0.50	0.75

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[1] Cell walls had been recemented in the laboratory.

In order to make comparative dust counts, using the Sedgwick-Rafter cell and the modified cell, 10 samples of various types of industrial dusts were collected with the impinger and quantification of the dust was carried out according to the present standard procedure (*4*). The average dust counts of five fields per sample are given in table 2. The data indicate the accuracy with which dust counts can be made by substituting the modified cell for the Sedgwick-Rafter counting cell.

TABLE 2.—*Comparative dust counts—Average count of 5 fields*

Sample No.	Sedgwick-Rafter cell	Modified cell	Sample No.	Sedgwick-Rafter cell	Modified cell
1	90	88	6	76	80
2	37	35	7	38	38
3	44	45	8	127	130
4	60	59	9	130	133
5	46	47	10	70	68

SUMMARY

A modified dust-counting cell has been constructed and described which has the following advantages over the Sedgwick-Rafter counting cell now generally used in the quantification of dust samples collected by the impinger method:

1. Any type of liquid media used for dust suspensions for quantification or for refractive indices observations may be used in the cell without subsequent damage to the cell.
2. The depth of the cell will remain constant, since there are no cemented parts. (Unnecessarily rough treatment might cause the 1-mm rim to become flanged.)
3. The cell, being of circular design, is free from corners and, hence, easy to clean. (Fair recommends this change of design in the Sedgwick-Rafter counting cell (*5*).)
4. In the event the lower disk becomes scratched, replacement can be made at very little cost.
5. The modified cell, being of more rugged construction than the Sedgwick-Rafter cell, is less subject to damage.
6. Cleaning is easily accomplished by taking the cell apart and immersing the lower lense in chromic acid cleaning solution.
7. The cost of the cell compares favorably with that of the Sedgwick-Rafter cell and there is less chance of breakage and need for replacement.

REFERENCES

(*1*) Greenburg, L., and Smith, G. W.: A new instrument for sampling aerial dusts. Bureau of Mines Reports of Investigations No. 2392 (September 1922).

(*2*) Greenburg, L., and Bloomfield, J. J.: The impinger dust sampling apparatus as used by the United States Public Health Service. Pub. Health Rep., 47: 654 (1932).

(*3*) Ross, H. S., and Sehl, F. W.: Determination of free silica. Analytical edition of Industrial and Engineering Chemistry, 7: 30 (1935).

(*4*) Bloomfield, J. J., and Dalla Valle, J. M.: The determination and control of industrial dust. Pub. Health Bull. No. 217 (1935).

(*5*) Whipple, George C.: Microscopy of drinking water, 4th ed. Revision by Gordon M. Fair and Melville C. Whipple. John Wiley & Sons, New York (1927).

DEATHS DURING WEEK ENDED FEBRUARY 12, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce

	Week ended Feb. 12, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	8,795	[1] 10,452
Average for 3 prior years	9,812	----------
Total deaths, first 6 weeks of year	54,514	65,052
Deaths under 1 year of age	527	[1] 616
Average for 3 prior years	619	----------
Deaths under 1 year of age, first 6 weeks of year	3,224	3,883
Data from industrial insurance companies:		
Policies in force	69,795,000	69,161,259
Number of death claims	13,550	13,490
Death claims per 1,000 policies in force, annual rate	10.1	10.2
Death claims per 1,000 policies, first 6 weeks of year, annual rate	10.0	11.5

[1] Data for 85 cities.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (------) indicate that cases or deaths may have occurred although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 19, 1938, and Feb. 20, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 19, 1938	Week ended Feb. 20, 1937	Week ended Feb. 19, 1938	Week ended Feb. 20, 1937	Week ended Feb. 19, 1938	Week ended Feb. 20, 1937	Week ended Feb. 19, 1938	Week ended Feb. 20, 1937
New England States:								
Maine	1	--------	13	512	87	5	0	0
New Hampshire	1	--------	2	--------	45	20	0	0
Vermont	1	--------	--------	--------	163	2	0	0
Massachusetts	7	8	--------	--------	209	833	2	6
Rhode Island	--------	1	--------	14	1	205	0	1
Connecticut	7	5	10	354	10	568	0	1
Middle Atlantic States:								
New York [5]	35	51	[1] 24	[1] 74	[5] 1,290	402	9	18
New Jersey	26	6	23	110	1,595	1,251	3	7
Pennsylvania	33	46	--------	--------	6,972	204	4	9
East North Central States:								
Ohio	19	20	--------	270	1,344	54	4	9
Indiana	45	6	22	220	455	12	0	3
Illinois	38	31	24	131	6,278	26	0	8
Michigan [2]	10	32	3	12	2,284	56	4	4
Wisconsin	6	1	70	308	3,137	14	1	0
West North Central States:								
Minnesota	2	3	3	4	85	18	0	3
Iowa	8	5	15	64	100	4	2	2
Missouri	8	12	153	1,565	1,183	9	1	2
North Dakota	--------	2	--------	41	15	2	0	1
South Dakota	--------	1	--------	11	--------	2	0	3
Nebraska	14	--------	9	15	16	1	1	1
Kansas	5	8	2	240	371	6	1	1
South Atlantic States:								
Delaware	3	--------	--------	8	34	129	0	1
Maryland	15	13	31	389	51	412	2	5
District of Columbia	7	5	1	27	6	--------	0	2
Virginia	15	15	--------	--------	439	188	8	9
West Virginia	7	12	80	725	391	3	11	9
North Carolina	17	29	25	93	2,357	55	3	1
South Carolina [3]	4	4	635	1,116	418	12	1	1
Georgia [3]	10	13	--------	1,189	1,576	--------	2	3
Florida [3]	5	11	5	36	413	8	3	2
East South Central States:								
Kentucky	19	9	49	521	689	70	15	24
Tennessee	5	22	101	750	511	21	2	6
Alabama [3]	10	14	200	1,154	629	2	5	6
Mississippi [3]	5	3	--------	--------	--------	--------	2	0

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 19, 1938, and Feb. 20, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 19, 1938	Week ended Feb. 20, 1937	Week ended Feb. 19, 1938	Week ended Feb. 20, 1937	Week ended Feb. 19, 1938	Week ended Feb. 20, 1937	Week ended Feb. 19, 1938	Week ended Feb. 20, 1937
West South Central States:								
Arkansas	13	6	219	798	445	3	3	3
Louisiana [3]	10	13	15	375	11	1	3	1
Oklahoma [4]	7	8	217	1,018	34	6	1	5
Texas [1]	58	56	859	4,284	170	522	1	8
Mountain States:								
Montana	1	--------	--------	276	8	--------	0	2
Idaho	1	--------	10	9	3	29	0	1
Wyoming	1	--------	1	1	3	1	0	0
Colorado	13	4	--------	--------	393	1	0	0
New Mexico	6	2	1	287	83	63	0	2
Arizona	1	2	157	401	15	208	0	2
Utah [2]	5	2	--------	--------	158	11	0	0
Pacific States:								
Washington	2	1	--------	51	10	12	2	1
Oregon	5	--------	71	352	16	12	2	0
California	28	30	57	4,126	205	83	4	11
Total	539	512	3,167	21,931	34,711	[illegible]	[illegible]	184
First 7 weeks of year	4,594	4,086	21,587	190,908	[illegible]	[illegible]	[illegible]	1,067

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Feb. 19, 1938	Week ended Feb. 20, 1937	Week ended Feb. 19, 1938	Week ended Feb. 20, 1937	Week ended Feb. 19, 1938	Week ended Feb. 20, 1937	Week ended Feb. 19, 1938	Week ended Feb. 20, 1937	Week ended Feb. 19, 1938
New England States:									
Maine	0	0	9	23	0	0	3	0	52
New Hampshire	0	0	47	6	0	0	0	0	2
Vermont	0	0	7	11	0	0	2	0	25
Massachusetts	0	0	311	252	0	0	2	2	104
Rhode Island	0	0	19	58	0	0	0	1	37
Connecticut	0	0	109	105	0	0	0	1	45
Middle Atlantic States:									
New York	0	0	771	1,107	0	0	3	6	505
New Jersey	1	0	139	204	0	0	3	2	200
Pennsylvania	0	1	552	834	0	0	3	4	381
East North Central States:									
Ohio	1	0	198	212	4	1	0	1	87
Indiana	0	1	111	165	17	2	0	1	27
Illinois	0	0	684	657	23	40	5	6	76
Michigan [2]	1	2	624	785	15	0	19	2	187
Wisconsin	0	0	264	320	4	5	2	0	102
West North Central States:									
Minnesota	0	1	151	199	21	8	1	0	39
Iowa	0	0	203	288	46	29	0	0	34
Missouri	2	0	170	301	47	70	7	1	52
North Dakota	0	0	42	59	41	6	0	2	19
South Dakota	0	0	11	69	0	3	0	0	26
Nebraska	1	0	57	112	16	3	0	0	10
Kansas	0	0	201	279	13	20	6	0	138
South Atlantic States:									
Delaware	0	0	11	18	0	0	0	3	8
Maryland [2]	1	0	50	42	0	0	4	1	64
District of Columbia	0	0	20	23	0	0	1	1	9
Virginia	0	1	37	16	0	0	3	2	99
West Virginia	1	1	53	57	0	3	10	1	59
North Carolina	2	0	33	42	2	0	1	1	343
South Carolina [3]	0	0	14	3	0	0	1	5	68
Georgia [3]	0	1	18	7	1	0	5	3	33
Florida [3]	2	0	22	8	0	0	2	2	9
East South Central States:									
Kentucky	0	2	106	43	14	0	3	11	98
Tennessee	1	0	12	28	10	0	1	7	18
Alabama [3]	0	0	28	13	0	0	1	3	21
Mississippi [3]	1	0	8	7	8	1	3	4	--------

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 19, 1938, and Feb. 20, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Feb. 19, 1938	Week ended Feb. 20, 1937	Week ended Feb. 19, 1938	Week ended Feb. 20, 1937	Week ended Feb. 19, 1938	Week ended Feb. 20, 1937	Week ended Feb. 19, 1938	Week ended Feb. 20, 1937	Week ended Feb. 19, 1938
West South Central States:									
Arkansas	0	3	17	10	20	4	4	0	144
Louisiana [3]	0	1	7	8	1	0	21	5	20
Oklahoma [4]	1	1	44	31	12	1	3	2	29
Texas [3]	2	2	128	108	19	2	19	10	214
Mountain States:									
Montana	0	0	18	51	6	11	1	1	19
Idaho	3	1	22	32	19	4	0	4	14
Wyoming	0	0	13	11	0	0	0	0	17
Colorado	1	0	33	34	7	7	1	0	8
New Mexico	0	0	10	40	0	3	0	3	17
Arizona	0	0	13	30	1	0	2	2	19
Utah [2]	0	0	77	14	2	0	0	0	80
Pacific States:									
Washington	1	0	57	52	34	2	0	1	141
Oregon	2	0	68	41	23	19	1	2	43
California	2	0	176	252	25	9	1	2	293
Total	26	18	5,781	7,067	453	253	144	105	3,965
First 7 weeks of year	150	159	41,718	43,602	4,071	2,081	851	803	27,809

[1] New York City only.

[2] Period ended earlier than Saturday.

[3] Typhus fever, week ended Feb. 19, 1938, 20 cases, as follows: South Carolina, 2; Georgia, 5; Florida, 1; Alabama, 3; Louisiana, 1; Texas, 8.

[4] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

[5] The number of cases of measles in the State of New York for the week ended Feb. 5, 1938 (Public Health Reports of Feb. 18, p. 271), should have been given as 706 instead of 4,706 as reported through an error in transmission.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
September 1937										
Arizona	0	22	71	3	26	1	7	19	0	12
November 1937										
South Carolina		173	835	493	63	46	1	30	0	5
December 1937										
South Carolina		148	1,202	136	154	45		31	0	6
January 1938										
Alabama	48	80	1,782	37	640	25	6	101	13	14
Illinois	15	176	137	10	13,423	3	5	3,080	257	0
Iowa	8	22	15		226		1	903	243	2
Maine	2	12	30		341		0	109	0	8
Maryland	8	52	109		69		2	242	0	11
Michigan	7	57	9		3,056		1	2,245	16	9
Minnesota	7	33	10		42		4	644	255	5
Missouri	6	161	619	9	6,381	1	2	1,278	242	31
Nebraska	3	8	14		18		1	168	5	5
New Jersey	11	62	50		4,105		1	524	0	6
Ohio	10	127	130		4,587		5	1,672	22	10
South Carolina		120	2,968	275	814	49	0	20	1	13
West Virginia	19	74	254		1,447		1	315	2	14

Summary of monthly reports from States—Continued

September 1937

	Cases
Arizona:	
Chickenpox	2
Dysentery	52
Encephalitis, epidemic or lethargic	3
Mumps	8
Trachoma	42
Undulant fever	2
Whooping cough	45

November 1937

	Cases
South Carolina:	
Chickenpox	78
Diarrhea	158
Dysentery (amoebic)	1
German measles	1
Hookworm disease	58
Mumps	32
Ophthalmia neonatorum	1
Paratyphoid fever	1
Rabies in animals	26
Septic sore throat	4
Tularaemia	1
Typhus fever	14
Whooping cough	125

December 1937

	Cases
South Carolina:	
Chickenpox	125
Dengue	1
Diarrhea	142
German measles	1
Hookworm disease	25
Mumps	28
Ophthalmia neonatorum	1
Rabies in animals	24
Septic sore throat	6
Tularaemia	1
Typhus fever	9
Undulant fever	1
Whooping cough	129

January 1938

	Cases
Actinomycosis:	
Michigan	1
Minnesota	1
Anthrax:	
Ohio	1
Chickenpox:	
Alabama	338
Illinois	2,442
Iowa	517
Maine	400
Maryland	781
Michigan	2,077
Minnesota	853
Missouri	699
Nebraska	234
New Jersey	3,127
Ohio	2,381
South Carolina	294
West Virginia	279
Dengue:	
Alabama	1
South Carolina	2
Diarrhea:	
Maryland	4
Ohio (under 2 years; enteritis included)	13
South Carolina	191

January 1938—Continued

	Cases
Dysentery:	
Illinois (amoebic)	2
Illinois (amoebic carriers)	18
Illinois (bacillary)	15
Maryland (bacillary)	6
Michigan (amoebic)	2
Michigan (bacillary)	1
Minnesota (amoebic)	1
Minnesota (bacillary)	1
Missouri	9
New Jersey (amoebic)	1
Ohio (amoebic)	1
Ohio (bacillary)	1
Encephalitis, epidemic or lethargic:	
Alabama	1
Illinois	8
Iowa	3
Michigan	1
Minnesota	1
Missouri	1
New Jersey	2
Ohio	2
German measles:	
Alabama	10
Illinois	95
Iowa	2
Maine	30
Maryland	8
Michigan	106
New Jersey	83
Ohio	24
South Carolina	2
Hookworm disease:	
South Carolina	67
Impetigo contagiosa:	
Maryland	16
Lead poisoning:	
Ohio	11
Mumps:	
Alabama	88
Illinois	990
Iowa	54
Maine	262
Maryland	58
Michigan	1,207
Missouri	254
Nebraska	82
New Jersey	696
Ohio	390
South Carolina	140
West Virginia	46
Ophthalmia neonatorum:	
Alabama	2
Illinois	2
Maryland	3
New Jersey	6
Ohio	73
South Carolina	2
Puerperal septicemia:	
Ohio	2
Rabies in animals:	
Alabama	92
Illinois	31
Maryland	1
Michigan	5
Missouri	12
New Jersey	5
South Carolina	40
Rabies in man:	
Michigan	1
Ohio	1
Rocky Mountain spotted fever:	
Maryland	2

January 1938—Continued

	Cases
Scabies:	
Maryland	1
Septic sore throat:	
Illinois	14
Iowa	7
Maine	1
Maryland	18
Michigan	51
Minnesota	18
Missouri	99
Nebraska	1
New Jersey	27
Ohio	115
Tetanus:	
Illinois	4
Maryland	1
Michigan	1
Missouri	1
Ohio	3
South Carolina	3
Trachoma:	
Illinois	26
Michigan	2
Minnesota	1
Missouri	24
New Jersey	1
Trichinosis:	
Maine	1
Maryland	2
New Jersey	2
Ohio	2
Tularaemia:	
Alabama	3
Illinois	18
Iowa	3
Maryland	1
Michigan	1
Minnesota	1
Missouri	24
Ohio	9
South Carolina	2
Typhus fever:	
Alabama	21
Illinois	1
Maryland	1
South Carolina	9
Undulant fever:	
Alabama	3
Illinois	3
Iowa	7
Maine	2
Maryland	2
Michigan	9
Minnesota	5
Missouri	1
New Jersey	4
Ohio	9
West Virginia	1
Vincent's infection:	
Illinois	15
Maine	27
Maryland	20
Michigan	16
Whooping cough:	
Alabama	121
Illinois	456
Iowa	170
Maine	402
Maryland	218
Michigan	817
Minnesota	175
Missouri	473
Nebraska	40
New Jersey	694
Ohio	475
South Carolina	219
West Virginia	550

WEEKLY REPORTS FROM CITIES

City reports for week ended Feb. 12, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	214	1,277	171	3,850	993	2,085	25	411	19	1,165	--------
Current week[1]	169	212	63	8,518	802	1,695	36	351	17	906	--------
Maine:											
Portland	0	------	0	15	0	2	0	0	0	29	29
New Hampshire:											
Concord	0	------	0	8	0	0	0	0	0	3	8
Manchester	0	------	0	1	3	5	0	0	0	0	10
Nashua	0	------	0	0	0	0	0	0	0	1	6
Vermont:											
Barre	0	------	0	0	1	0	0	0	0	0	2
Burlington	0	------	0	8	0	1	0	0	0	3	9
Rutland	0	------	0	0	0	0	0	0	0	0	12
Massachusetts:											
Boston	1	------	0	96	21	66	0	4	0	13	227
Fall River	0	------	2	0	2	3	0	0	0	10	22
Springfield	0	------	0	1	5	9	0	0	0	3	40
Worcester	0	------	0	3	14	21	0	1	0	1	61
Rhode Island:											
Pawtucket	0	------	0	0	2	7	0	2	0	0	16
Providence	0	------	1	1	6	22	0	4	0	15	70
Connecticut:											
Bridgeport	3	1	1	0	4	31	0	2	0	0	27
Hartford	0	------	0	0	7	21	0	0	0	0	45
New Haven	0	------	0	1	2	3	0	0	0	1	39
New York:											
Buffalo	0	------	0	2	14	30	0	3	0	14	130
New York	29	18	2	236	120	291	0	83	2	167	1,505
Rochester	1	2	0	6	4	9	0	1	0	7	65
Syracuse[2]	2	------	0	14	5	18	0	1	0	3	63
New Jersey:											
Camden	2	------	0	43	7	3	0	1	0	1	42
Newark	0	------	0	20	8	4	0	5	0	18	97
Trenton	0	------	0	13	5	2	0	1	0	6	49
Pennsylvania:											
Philadelphia	8	5	5	483	30	98	0	18	1	41	491
Pittsburgh	0	5	1	273	27	47	0	7	1	14	180
Reading	1	------	0	5	1	4	0	1	1	1	23
Scranton	0	------	--------	36	-------	1	0	-------	0	2	--------
Ohio:											
Cincinnati	1	1	1	2	12	24	0	8	0	4	131
Cleveland	4	13	0	136	14	82	0	6	0	38	193
Columbus	0	------	0	128	5	6	0	4	0	3	74
Toledo	3	3	1	100	6	11	0	5	0	17	67
Indiana:											
Anderson	0	------	0	2	0	8	9	0	0	5	8
Fort Wayne	0	------	0	30	3	17	1	1	0	0	28
Indianapolis	16	------	0	51	14	18	0	6	0	3	103
Muncie	0	------	0	59	1	0	0	0	0	0	15
South Bend	0	------	1	2	3	4	0	0	0	0	21
Terre Haute	8	------	0	14	0	2	0	0	0	0	15
Illinois:											
Alton	0	------	0	0	2	9	0	0	0	0	11
Chicago	8	16	3	2,359	63	275	0	38	0	34	762
Elgin	0	------	0	6	2	12	0	0	0	1	13
Moline	0	------	0	50	0	16	0	0	1	1	6
Springfield	1	------	0	0	5	6	1	0	0	0	30
Michigan:											
Detroit	11	3	3	1,242	19	172	0	11	1	83	240
Flint	0	------	0	7	2	21	0	0	0	20	16
Grand Rapids	0	------	0	15	3	15	0	1	0	6	35
Wisconsin:											
Kenosha	0	------	0	5	2	0	0	0	0	3	10
Madison	1	------	0	0	7	9	0	0	0	3	36
Milwaukee	2	------	0	1,688	5	24	0	4	0	22	99
Racine	0	------	0	6	2	22	0	2	1	0	17
Superior	0	------	0	0	1	1	0	0	0	1	12

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[1] Figures for Winston-Salem and Savannah estimated; reports not received.

[2] The report of 1 case of encephalitis in Syracuse for the week ended Jan. 1, Public Health Reports, Jan. 21, 1938, p. 108, was in error, no case of the disease having occurred.

City reports for week ended Feb. 12, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	0	0	1	5	0	1	0	7	22
Minneapolis	0	------	1	4	4	13	4	0	0	1	105
St. Paul	1	1	1	0	7	7	5	0	0	4	59
Iowa:											
Cedar Rapids	0	------	--------	1	-------	1	0	-------	0	0	--------
Davenport	1	------	--------	15	-------	3	0	-------	0	0	--------
Des Moines	0	------	--------	0	-------	31	2	-------	0	0	38
Sioux City	1	------	--------	0	-------	6	0	-------	0	1	--------
Waterloo	2	------	--------	0	-------	3	0	-------	0	0	--------
Missouri:											
Kansas City	0	3	2	122	16	18	1	7	0	4	132
St. Joseph	0	------	0	10	10	2	0	1	0	0	45
St. Louis	5	------	1	42	11	57	2	6	0	3	211
North Dakota:											
Fargo	0	------	0	0	1	7	0	0	0	4	5
Grand Forks	0	------	--------	1	-------	1	0	-------	0	0	--------
Minot	0	------	0	0	0	1	2	0	0	4	6
South Dakota:											
Aberdeen	0	------	--------	0	-------	1	0	-------	0	1	--------
Sioux Falls	0	------	0	0	0	4	0	0	0	0	8
Nebraska:											
Lincoln	2	------	--------	3	-------	14	0	-------	0	3	--------
Omaha	0	------	0	2	8	6	1	0	0	0	60
Kansas:											
Lawrence	0	------	0	0	2	1	0	1	0	3	11
Topeka	0	------	0	5	3	0	0	0	0	16	13
Wichita	1	------	0	2	10	5	0	1	0	1	36
Delaware:											
Wilmington	0	------	0	11	8	3	0	1	0	3	36
Maryland:											
Baltimore	13	8	3	7	32	31	0	9	0	41	238
Cumberland	0	1	1	0	0	0	0	0	0	2	14
Frederick	0	------	0	0	0	0	0	0	0	0	4
District of Columbia:											
Washington	10	1	0	11	20	15	0	8	0	12	161
Virginia:											
Lynchburg	3	------	0	3	0	1	0	0	0	3	9
Norfolk	1	------	0	79	3	5	0	2	0	2	27
Richmond	0	------	0	66	13	4	0	6	1	1	67
Roanoke	0	------	0	0	1	1	0	2	0	0	15
West Virginia:											
Charleston	0	------	0	114	3	1	0	1	0	0	11
Huntington	0	------	--------	10	-------	0	0	-------	0	0	--------
Wheeling	0	------	0	8	6	2	0	1	0	2	24
North Carolina:											
Gastonia	0	------	--------	0	-------	0	0	-------	0	1	--------
Raleigh	0	------	0	11	1	0	0	1	0	29	8
Wilmington	0	------	0	14	8	0	0	1	0	13	10
Winston-Salem	-------	------	--------	-------	-------	-------	-------	-------	-------	-------	--------
South Carolina:											
Charleston	0	30	3	87	4	0	0	4	1	0	29
Florence	0	------	0	18	0	0	0	0	0	0	8
Greenville	0	------	0	0	3	0	0	1	0	9	8
Georgia:											
Atlanta	0	16	2	179	16	6	0	3	0	3	107
Brunswick	0	------	0	0	0	0	0	0	0	0	5
Savannah	-------	------	--------	-------	-------	-------	-------	-------	-------	-------	--------
Florida:											
Miami	1	1	0	103	3	1	0	1	0	0	39
Tampa	1	------	0	2	1	1	0	0	0	0	28
Kentucky:											
Covington	0	1	--------	1	1	3	0	0	0	0	14
Louisville	1	------	0	142	11	29	0	3	0	4	74
Tennessee:											
Knoxville	0	------	2	9	1	2	0	2	0	0	27
Memphis	2	7	3	251	16	4	0	4	0	1	95
Nashville	1	------	0	54	11	6	0	1	0	12	30
Alabama:											
Birmingham	1	8	2	190	15	5	0	3	0	0	88
Mobile	0	------	1	12	0	0	0	1	0	0	29
Montgomery	0	------	--------	14	-------	0	0	-------	0	1	--------
Arkansas:											
Fort Smith	1	------	0	16	-------	3	0	-------	1	0	--------
Little Rock	0	------	0	106	8	2	0	0	0	0	10

City reports for week ended Feb. 12, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	------	0	0	1	2	0	3	0	1	7
New Orleans	3	15	8	0	26	1	0	11	2	10	169
Shreveport	0	------	0	5	9	3	0	2	0	0	35
Oklahoma:											
Muskogee	0	------	------	0	------	1	0	------	0	0	------
Oklahoma City	2	3	0	0	6	4	0	0	0	2	59
Tulsa	1	------	------	3	------	5	0	------	0	13	------
Texas:											
Dallas	1	1	1	4	7	17	0	2	1	2	76
Fort Worth	3	------	2	1	12	6	3	2	0	4	49
Galveston	1	------	0	0	1	1	0	1	1	0	21
Houston	3	------	0	2	6	5	0	3	1	0	70
San Antonio	3	------	3	0	4	0	0	7	0	3	60
Montana:											
Billings	0	------	0	1	3	1	0	0	0	0	10
Great Falls	0	------	0	0	1	0	4	0	0	9	6
Helena	0	------	0	0	2	0	0	0	0	4	5
Missoula	0	1	0	0	0	0	0	0	0	0	9
Idaho:											
Boise	0	------	0	0	0	1	8	0	0	0	5
Colorado:											
Colorado Springs	0	------	0	1	0	4	0	1	0	1	9
Denver	5	------	1	237	10	21	1	4	0	0	62
Pueblo	0	------	0	1	3	3	0	0	0	7	10
New Mexico:											
Albuquerque	0	------	1	9	1	6	0	6	0	1	18
Utah:											
Salt Lake City	0	------	1	50	4	13	3	2	0	5	35
Washington:											
Seattle	3	------	1	4	5	4	1	4	0	50	88
Spokane	0	1	1	0	4	1	0	0	0	1	32
Tacoma	0	------	0	0	3	5	0	0	0	23	33
Oregon:											
Portland	2	1	0	3	6	22	2	1	0	0	98
Salem	0	1	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	12	31	3	8	36	32	4	24	1	20	408
Sacramento	2	1	1	1	3	0	0	1	0	18	25
San Francisco	0	------	2	3	6	10	0	12	1	25	174

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Boston	1	0	0
Rhode Island:			
Providence	1	1	0
New York:			
Buffalo	3	0	0
Pennsylvania:			
Philadelphia	2	0	0
Ohio:			
Cleveland	1	1	0
Columbus	1	0	0
Indiana:			
Indianapolis	4	1	0
Illinois:			
Chicago	2	1	0
Michigan:			
Detroit	3	1	1
Minnesota:			
St. Paul	1	0	0
Iowa:			
Des Moines	1	0	0
Missouri:			
Kansas City	1	0	0
St. Joseph	0	1	0
Maryland:			
Baltimore	2	0	0
District of Columbia:			
Washington	1	1	0
Virginia:			
Norfolk	1	0	0
West Virginia:			
Charleston	1	0	0
Wheeling	2	0	0
North Carolina:			
Wilmington	1	0	0
Winston-Salem	1	0	0
Tennessee:			
Knoxville	0	1	0
Alabama:			
Birmingham	2	1	0
Louisiana:			
New Orleans	1	0	0
California:			
Los Angeles	0	0	1

Encephalitis, epidemic or lethargic.—Cases: Chicago, 1; Fort Worth, 1; Los Angeles, 1.
Pellagra.—Cases: Atlanta, 3; Savannah, 3; New Orleans, 1; Los Angeles, 1.
Typhus fever.—Cases: New York, 1; Mobile, 1.

FOREIGN AND INSULAR

CUBA

Habana—Communicable diseases—4 weeks ended January 15, 1938.—During the 4 weeks ended January 15, 1938, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	16		Poliomyelitis	[1] 4	
Leprosy		1	Tuberculosis	9	3
Malaria	[1] 15	2	Typhoid fever	[1] 13	4

[1] Includes imported cases.

Provinces—Notifiable diseases—4 weeks ended January 8, 1938.—During the 4 weeks ended January 8, 1938, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer		1	1	7		1	10
Chickenpox		3			15		18
Diphtheria	6	12		3	5	4	30
Dysentery (bacillary)				1			1
Hookworm disease		21		1			22
Leprosy		4	1	2	3	2	12
Malaria	38	28	31	75	48	101	321
Measles	1	1	1				3
Poliomyelitis		4		1		3	8
Tuberculosis	37	23	25	38	39	27	189
Typhoid fever	4	23	18	21	1	42	109
Yaws						27	27

CZECHOSLOVAKIA

Communicable diseases—November 1937.—During the month of November 1937, certain communicable diseases were reported in Czechoslovakia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	4		Malaria	147	
Cerebrospinal meningitis	7	2	Paratyphoid fever	15	
Chickenpox	379		Poliomyelitis	29	2
Diphtheria	4,804	188	Puerperal fever	41	11
Dysentery	306	45	Scarlet fever	2,828	17
Influenza	87	5	Trachoma	92	
Lethargic encephalitis	3	1	Typhoid fever	731	48

LATVIA

Notifiable diseases—October-December 1937.—During the months of October, November, and December 1937, cases of certain notifiable diseases were reported in Latvia as follows:

Disease	October	November	December	Disease	October	November	December
Anthrax			1	Mumps	3	6	18
Botulism	2			Paratyphoid fever	17	4	4
Cerebrospinal meningitis	9	2	4	Poliomyelitis	21	20	20
Diphtheria	113	122	128	Puerperal septicemia	12	5	5
Epidemic encephalitis	2		1	Scarlet fever	361	529	459
Erysipelas	51	52	56	Tetanus	3	2	2
Influenza	50	100	131	Trachoma	65	77	62
Lead poisoning	1			Tuberculosis	266	261	249
Leprosy		4		Typhoid fever	78	44	30
Measles	5	11	4	Undulant fever		1	
				Whooping cough	107	247	374

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for February 25, 1938, pages 313-327. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

French Indochina.—During the week ended February 12, 1938, 151 cases of cholera were reported in Annam Province, and 27 cases of cholera in Tonkin Province, French Indochina.

Plague

Hawaii Territory—Island of Hawaii—Hamakua District.—One rat found on February 3, 1938, in Hamakua Mill Sector, and one rat found on February 7 and another rat found on February 10 in Paauhau Sector, all in Hamakua District, Island of Hawaii, Hawaii Territory, have been proved positive for plague.

Niger (French)—Tanout.—During the month of December 1937, 145 cases of plague with 109 deaths were reported in northern Tanout, French Niger.

Smallpox

Salvador.—During the month of January 1938, 16 suspected cases of smallpox were reported in Salvador, as follows: Seven cases in San Miguel Department, and nine cases in Sonsonate Department.

On vessel—"Empress of Japan."—On February 21, 1938, one case of smallpox (varioloid) was reported in a member of the crew of the S. S. *Empress of Japan*, at Honolulu. It was reported that all sanitary measures had been taken.

Yellow Fever

Belgian Congo—Zongo.—During the period February 4–12, 1938, four deaths from suspected yellow fever and an additional two cases of suspected yellow fever were reported in Zongo, Belgian Congo.

Brazil.—Yellow fever has been reported in Brazil as follows: Minas Geraes State—Gymirim, January 18, one death; Juiz de Fora, January 18, one death, January 25–26, two deaths; Mathias Barbosa, January 20, one death; Rio Novo, January 22, one death. Rio de Janeiro State—Entre Rios, January 21, one death.

Colombia—Cundinamarca Department—Yacopi.—On January 15, 1938, one death from yellow fever was reported in Yacopi, Cundinamarca Department, Colombia.

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MARCH 11 - - - - 1938

IN THIS ISSUE

The Henry R. Carter Memorial Laboratory at Savannah, Ga.
Study of the Prevalence of Trichinosis in the United States
Prevalence of Trichinella spiralis in the Hawaiian Islands

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THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg. Gen. ROBERT OLESEN, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

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PUBLIC HEALTH REPORTS

VOL. 53 MARCH 11, 1938 NO. 10

THE HENRY R. CARTER MEMORIAL LABORATORY

A New Laboratory Dedicated to the Study of Malaria Control

On February 8, 1938, the Henry R. Carter Memorial Laboratory of the United States Public Health Service, at Savannah, Ga., was formally dedicated. It is the purpose to study there the various problems of malaria control, with special attention to the development of new methods and the improvement of old methods with reference to efficacy and economies. This work is being conducted under the supervision of the Office of Malaria Investigations, a subdivision of the Division of Infectious Diseases of the National Institute of Health, and is under the direction of Senior Surg. L. L. Williams, Jr.

Many observations have been made which indicate the possibility of controlling malaria or preventing the production of the mosquito vector of the disease by means of some method other than mechanical. The Public Health Service therefore decided to make an intensive search for a natural or biological method of controlling production of the malaria-carrying mosquito. During the malaria investigations, stations and laboratories were established at Memphis, Tenn.; Columbia, S. C.; Jacksonville and Miami, Fla.; Washington, D. C.; and Panama, Canal Zone. None of these stations, however, were well suited for detailed biological researches. As the region around Savannah, Ga., offered exceptional opportunities for studying the mosquito in question under many different breeding conditions, a laboratory unit was set up there in 1937. Senior Surg. Thomas H. D. Griffitts was placed in immediate charge of the laboratory and was given a staff of two entomologists, a limnologist, a physicist, and a medical officer. Dr. Griffitts operated this laboratory in temporary quarters until the city of Savannah provided a new laboratory, the one which has just been dedicated. It is hoped that, through the studies conducted there, refinements of old methods will be developed and new and cheaper methods for the control of malaria may be discovered.

The adequacy of draining malaria mosquito breeding places has been well established and the utility of larvicides, such as paris green, light oils, and pyrethrum extract, in killing mosquito larvae has been demonstrated. These measures, however, entail certain expenses which are prohibitive for protection of small groups of people living close to large breeding areas. Therefore, for many years malariologists have been searching for easier and cheaper methods of controlling the disease or of controlling production of the mosquito which transmits it, the *Anopheles*, especially the *quadrimaculatus* in the South. Some of the measures suggested have been partially successful; none of them entirely so. Top minnows eat mosquito larvae, but they cannot be depended upon to control mosquito production unless aided by expensive clearing operations. Wholesale drug administration to the population is successful only in controlling clinical attacks of the disease and does not affect the infection rate nor prevent chronic malaria. Screening is effective only for people who stay behind screens all night, and every night.

At the Henry R. Carter Memorial Laboratory, studies are under way to determine the physical and entomological requirements for mosquito production. The physical characters (soil, light and shade, temperature, and similar conditions) are analyzed, and the effect of each is tested; larvae food is identified, and food requirements are determined; eggs and their hatching are investigated; and an insectory is operated to supply large numbers of insects to be used in conducting the numerous experiments. In addition, the local prevalence of malaria is closely watched, and certain sections will be used to test the efficacy of drugs suggested as likely to have value in the prophylaxis against the disease. It is the aim of the laboratory to secure malaria control, or mosquito control, at the lowest cost and, if possible, by biological rather than engineering methods.

It is fitting that this laboratory, devoted to the study of malaria control, should bear the name of and honor the late Dr. Henry R. Carter, Assistant Surgeon General of the Public Health Service, who conducted with conspicuous success the first campaign for the control of malaria attempted in this country. He was one of the first investigators to call attention to the effect of impounded waters on the prevalence of malaria; and during the World War he was in charge of the control of malaria in the extra-cantonment areas of the camps east of the Rocky Mountains.

Great as they were, Dr. Carter's contributions to malariology were equalled by his work in other fields of public health. In 1900–1901, in a brilliant epidemiological study, he discovered the extrinsic incubation of yellow fever, which, alone, would accord him a high place among investigators, while his institution of precautions for vessels at ports of departure has been described as the greatest advance in maritime quarantine since the method of maritime quarantine was established by the Venetians.

Dr. Carter was well qualified by education and innate ability for the study of tropical diseases. He was graduated at the University of Virginia as a civil engineer, with special work in chemistry and mathematics, and later graduated in medicine at the University of Maryland. He was born in Virginia on August 25, 1852, and died in Washington, D. C., on September 14, 1925. He was in active service in the Public Health Service for more than 40 years—from 1879 until he was placed on waiting orders in 1920.

PREVALENCE OF TRICHINOSIS IN THE UNITED STATES

By WILLI SAWITZ, M. D., *Parasitology Laboratory, Department of Tropical Medicine, Tulane University of Louisiana, New Orleans, La.*

INTRODUCTION

Knowledge of the strength of the enemy is as necessary in the control of human parasites as it is in a war between nations (*1*). In order to obtain information regarding the distribution of *Trichinella spiralis*, an investigation was made to determine the extent to which this nematode has already invaded human territory in the United States.

In 1915, Ransom (*2*) summarized the reported cases of trichinosis in the United States up to 1915, but the data since then are scattered throughout the literature. In this paper an attempt has been made to ascertain the present status of human trichinosis in the United States. This survey is necessarily incomplete and fragmentary, as are the reports on which the statistics are based. Only 32 States required the reporting of trichinosis in 1933 (*3*), and even in these States the figures are incomplete, as shown by the number of *Trichinella* infections revealed by autopsy surveys. Although these autopsy findings may have revealed infections which did not show characteristic clinical symptoms in so far as these are known at present, the number found in autopsy cases is representative of the rate of occurrence of the infection in the general population (*4*). To find figures for the other States, it is necessary to refer to papers on trichinosis in medical journals.

These restrictions limit conclusions. The tables, curves, and maps in this paper showing prevalence, geographic distribution, and seasonal fluctuation, therefore, only approximate the true picture of the present status of *Trichinella spiralis* infections in human beings.

SOURCES OF MATERIAL

While most of the data given in this paper have been obtained from the literature, some information has been secured by personal communications with Dr. Robert Olesen, Assistant Surgeon General, Division of Sanitary Reports and Statistics, United States Public Health Service, Dr. E. C. Joss, Chief, Meat Inspection Division, Bureau of Animal Industry, and the administrative officers of the departments of health of the 32 States in which trichinosis is a reportable disease, viz, Alabama, California, Colorado, Connecticut, Delaware, Florida, Georgia, Illinois, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, New Jersey, New Mexico, New York, North Dakota, Ohio, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Utah, Washington, West Virginia, Wyoming.

The writer wishes to express his thanks to these officers for their kind cooperation.

INCIDENCE OF TRICHINOSIS

In table 1 the number of clinical cases of trichinosis is given by months for the years 1915–36 *as reported* to the United States Public Health Service (*5*). The figures for 1929–36 have been checked by the Public Health Service, Division of Sanitary Reports and Statistics, and corrections not originally published in the Public Health Reports have been made. The figures obtained from the State Board of Health of Connecticut for the years 1924–36 do not agree with those given in the Public Health Reports for the following months:

December 1926	1 (our figure 2).
April 1929	1 (our figure 2).
April 1930	2 (our figure 1).
March 1933	13 (our figure 10).
February 1935	5 (our figure 0).
May 1935	4 (our figure 0).
July 1935	3 (our figure 2).

TABLE 1.—*Cases of trichinosis reported to the U. S. Public Health Service for the years 1915–36, tabulated by States and by months*

Year and State	Jan	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept	Oct.	Nov.	Dec.	Total
1915													
Oregon												10	10
1916 (none)													
1917 (none)													
1918 (none)													
1919													
California							7						7
Georgia							6	1					7
South Dakota	2												2
Total	2						13	1				10	26
1920													
California	1	1									1		3
Connecticut												2	2
Florida								1					1
Illinois			7										7
Massachusetts	3			3									6
New Jersey									1		2	3	6
Total	4	1	7	3	0	0	0	1	1	0	3	5	25
1921													
Connecticut	13		1		1								15
Massachusetts				2	5		1		1		1		10
New Jersey	2			2	1							2	7
New Mexico									1				1
Total	15	0	1	4	7	0	1	0	2	0	1	2	83

TABLE 1.—*Cases of trichinosis reported to the U. S. Public Health Service for the years 1915–36, tabulated by States and by months*—Continued

Year and State	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1922													
Connecticut	4								1				5
Florida											1	5	6
Kansas				1									1
Massachusetts		6	1			2			1	4	1	2	17
New Jersey		26	1									2	29
Total	4	32	2	1	0	2	0	0	2	4	2	9	58
1923													
Alabama	1												1
Connecticut			2	1				4		2			9
Florida					1								1
Massachusetts		1	2	1		1		2	1		2	2	12
New Jersey										1	1		2
Total	1	1	4	2	1	1	0	6	1	3	3	2	25
1924													
Colorado									1				1
Connecticut	2	2	1	3		1		1		2			12
Georgia									1				1
Kansas	1												1
Massachusetts	13	9	3	1	3		2	2		1	3	2	39
New Jersey		2	5		1					1			9
Oregon		5											5
Total	16	18	9	4	4	1	2	3	2	4	3	2	68
1925													
Connecticut	3	4		1			1			2			11
Georgia					1				2				3
Massachusetts	9	4	2	2		4		2			2	1	26
New Jersey	1		8		1	2						1	13
Washington			8										8
Total	13	8	18	3	2	6	1	2	2	2	2	2	61
1926													
California			2										2
Connecticut				1								2	3
Illinois										1			1
Massachusetts	1	3		3		3	2		2		2	2	18
New Jersey				3									3
Oregon												1	1
South Dakota											1		1
Total	1	3	2	7	0	3	2	0	2	1	3	5	29
1927													
California	8	3	2	19							2	2	36
Connecticut			1						2	1	3		7
Illinois									2				2
Iowa			3										3
Minnesota		1				3							4
Montana								1					1
New Jersey										1	2	13	16
Pennsylvania		4	6	2									12
Total	8	8	12	21	0	3	0	1	4	2	7	15	81
1928													
California	3	3	10	3					1			2	22
Connecticut			4	2						1	2		9
Illinois			1										1
Massachusetts	9				1			4					14
New Jersey	1	14	1			1			3			2	22
Pennsylvania					1	1							2
Total	13	17	16	5	2	2	0	4	4	1	2	4	70

TABLE 1.—*Cases of trichinosis reported to the U. S. Public Health Service for the years 1915–36, tabulated by States and by months*—Continued

Year and State	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1929													
California			1	1								23	25
Connecticut	9			2						1		2	14
Georgia					2	1							3
Illinois					1				1				2
Massachusetts	1		6	2	2	1	2				1		15
New Jersey			1	3									4
New York										1			1
Ohio		4			8							1	13
Pennsylvania			6				2	2			2		12
South Dakota									2				2
Washington		1											1
Total	10	5	14	8	13	2	4	2	3	2	3	26	92
Total, 1915–29	87	93	85	58	29	20	23	20	23	19	29	82	565
1930													
California	65	19	5	31	4	1	3	4	2	5	2	2	143
Colorado								1					1
Connecticut				1				3	1		1	1	7
Georgia		1									3		4
Illinois							1	1			3	1	6
Kansas				1									1
Maryland	1												1
Massachusetts		5				3	2		3	1	2	3	19
Minnesota		17											17
New Jersey	1	4		1					1		5		12
Ohio		1											1
Pennsylvania		2		17	3	2	11		1		4	10	50
South Dakota				4								1	5
Total	67	49	5	55	7	6	17	9	8	6	20	18	267
1931													
California	3	5		3	1		6		2	18	2		40
Connecticut	1			2	7		1		1		1	2	15
Illinois		3						1		2			6
Iowa				1									1
Maryland			2	2									4
Massachusetts		1	1		5	1			1	1	2	1	13
New Jersey			3					1		3	2	1	10
New York	18	6	8	6	10		3	3	5	9	5	2	75
Ohio					1					1			2
Pennsylvania		11	3					1		6			21
South Dakota		2											2
Tennessee							1						1
Total	22	28	17	14	24	1	11	6	9	40	12	6	190
1932													
California	10	2	6	1		2	14	34		1	10	1	81
Connecticut	1	2				2					1	5	11
Illinois	1	1	1						2	1	1	2	9
Iowa	1	1											2
Maine							1						1
Maryland	1							1				2	4
Massachusetts				1		2	1	8	1	2			15
Montana										1			1
New Jersey							6			1	1	9	17
New York	16	3	6	3	2	2	6	6	2	8	8	6	68
North Dakota			11										11
Ohio	11				1			2	2				16
Oregon									17				17
Pennsylvania			1			2			2			1	6
South Dakota					1	1	1			1			4
Total	41	9	25	5	4	11	29	51	26	15	21	26	263
1933													
California	3	1	4	4	5	5	2	1	4	13	7	2	51
Connecticut		3	10	1	1				1			1	17
Illinois	3	1	3	7			1		1				16
Iowa					1								1
Maryland				1						2			3
Massachusetts		21	1	1		4		2		7	4	1	41

TABLE 1.—*Cases of trichinosis reported to the U. S. Public Health Service for the years 1915–36, tabulated by States and by months*—Continued

Year and State	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1933													
Michigan										1		1	2
Minnesota									1				1
New Jersey		3	2	1	1	3			1		2	10	23
New York	10	8	18	12	10	1	2	2	17	24	12	16	132
Ohio				8		1						1	10
Oregon			1										1
Pennsylvania	1	4	3					1	4		1		14
South Dakota					1			1					2
Total	17	41	42	35	19	14	5	7	29	47	26	32	314
1934													
California	1	11	2	4	4	1	3	1	3	10	9	3	52
Connecticut	1	2	4		1	2	3	1	1	1	6	6	28
Illinois	3	3	2	1			1	1			1		12
Iowa	1		5	3							2		11
Maryland	1		1	1									3
Massachusetts	1	4	1	1	2	1	4	1	3	1	14	13	46
Michigan			9			2			1	6	1	1	20
Minnesota		6			13								19
Montana			1										1
New Jersey	3	14	1	6		2	3		1	4	1	4	39
New York	23	20	30	9	16	10	6	10	9	12	23	29	197
Ohio		1		2		2	1			1		1	8
Pennsylvania		1	9	2	4								16
South Dakota							1						1
Total	34	62	65	29	40	20	22	14	18	35	57	57	453
1935													
California	5	6	8	8	6	2	2	5	6	15	6	2	71
Connecticut	3		2	2			2		1	4	2	3	19
Georgia									1				1
Illinois	3	1	3	3	1		4			5			20
Iowa	10	1											11
Maine			9	43	2			1		1	6		62
Maryland			1						2				3
Massachusetts	5	22	4	1		1	1	2	3	3	3	2	47
Michigan	3	15		1	1	2						1	23
Minnesota		1		2	4					2	1		10
New Jersey	2		2	2						2	3		11
New York	35	32	16	12	55	24	14	7	11	6	22	6	240
Ohio	12	12	7	1				1	1	3			37
Oregon						2			1				3
Pennsylvania	4	3	2	1							1	1	. 12
Rhode Island	6									1			7
South Dakota	2				1		1						4
Virginia								1					1
Total	90	93	54	76	70	31	24	17	26	42	44	15	582
1936													
California	11		2	2	2	3	2	1	1	12	2	2	40
Connecticut	1	1	4			2	1		1			1	11
Georgia		1							1				2
Illinois		4						1	3			1	9
Maryland	6											1	7
Massachusetts	2	2				1		5	3				13
Michigan	1		32			4		1					38
New Jersey	3	1					1		1	1		2	9
New York	37	25	18	8	15	12	1	5	11	6	13	21	172
Ohio		7				1							8
Pennsylvania	10	1	1		1						1		14
Rhode Island			1										1
South Dakota			2							1			3
Tennessee	3		1										4
Total	74	42	61	10	18	23	5	13	21	20	16	28	331
Total, 1930–36	345	324	269	224	182	106	113	117	137	205	196	182	2,400
Total, 1915–36	432	417	354	282	211	126	136	137	160	224	225	264	2,968

In figure 1 is presented graphically the annual number of cases of human trichinosis reported to the Public Health Service for the years 1915–36.

This curve (fig. 1) shows a definite rise beginning in 1930. Prior to 1930 the number reported annually remained below 100; since that time it has been higher, with a peak of 582 cases in 1935.

For trichinosis, as for other diseases, the increase in reported cases may represent a true increase in incidence or only an increase in the number of cases diagnosed and reported, owing to expansion of the reporting area, to better diagnostic methods, or greater interest in and better reporting of the disease.

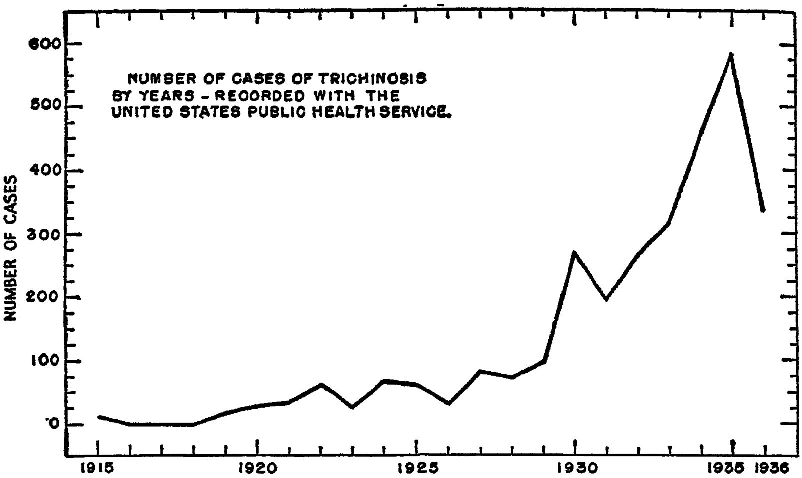

FIGURE 1.

The number of States which require the reporting of trichinosis has increased from year to year, and the increase in reports may be partly due to this fact. If this factor is eliminated by calculating the annual ratio of the reported cases to the population in the reporting States, an increase in the morbidity rate is still shown. In the following table the populations are included only for those States requiring the reporting of trichinosis during the periods under consideration. The number of cases of trichinosis reported in those States during the years 1915–36 are given.

Year	Cases	Population	Cases reported per 1,000,000 population	Year	Cases	Population	Cases reported per 1,000,000 population
1915	10	[1] 20,945,000	0.47	1926	27	[1] 43,323,000	0.62
1916	0	[1] 21,274,000	0	1927	42	[1] 47,882,000	.87
1917	0	[1] 21,700,000	0	1928	48	[1] 54,904,000	.87
1918	0	[1] 22,849,000	0	1929	66	[1] 60,276,000	1.09
1919	9	[1] 28,744,000	.39	1930	266	[2] 79,075,000	3.36
1920	12	[2] 27,546,000	.43	1931	189	[1] 80,119,000	2.35
1921	32	[1] 30,236,000	1.05	1932	261	[1] 80,609,000	3.23
1922	51	[1] 32,502,000	1.57	1933	313	[1] 81,058,000	3.86
1923	24	[1] 39,882,000	.60	1934	442	[1] 81,549,000	5.41
1924	66	[1] 40,605,000	1.62	1935	563	[1] 82,088,000	6.85
1925	61	[1] 41,195,000	1.48	1936	330	[1] 84,292,000	3.91

[1] Estimated. [2] Census.

The curve plotted from these rates is almost parallel to the curve in figure 1, indicating that the rise in trichinosis cases cannot be explained solely by the increasing number of reporting States.

No new diagnostic method for trichinosis was used during the years under consideration. The biopsy method was in use soon after Zenker, Virchow, and Leuckart (*6*, *7*, *8*) published their first studies on trichinosis in 1860. The marked eosinophilia was found by Brown in 1897 (*9*) to be of importance in the diagnosis of trichinosis. Although the skin test was discovered by Bachmann (*10*) in experimental trichinosis in 1927–28, it was first applied to the diagnosis of human trichinosis under controlled conditions by Augustine and Theiler (*11*) in 1932. The precipitin test was not a reliable diagnostic method in man during the time here concerned. New diagnostic methods, therefore, are not essentially responsible for the increase in reported cases.

An increase in the number of cases of a disease always stimulates an increased interest in it, with the result that more cases are diagnosed. For trichinosis the beginning of this cycle cannot be definitely determined and the part that this increased interest plays in the number of reported cases is unknown. Therefore, the question cannot be answered as to whether the statistical increase indicates a true increase. That in recent years more mild cases of trichinosis were diagnosed and reported can be shown by the decreasing mortality rate, as shown in the following reports:

Years	Reported by—	Number of cases	Number of deaths	Case mortality, percent
1842–1914	Ransom (*2*)	1,558	240	15.4
1915–25	Medical journals (see table 3)	212	17	8.0
1931	U. S. Public Health Service	190	13	6.8
1932	do	263	19	7.2
1926–36	Medical journals (see table 3)	1,372	61	4.4

Since no successful treatment for trichinosis is known, the declining mortality rate indicates either that such mild cases formerly occurred but were overlooked or that they now occur more frequently. No proof can be offered for either one of these possibilities, but an explanation for the increasing number of mild cases reported recently can be derived from that given by Ransom (*2*) and by Hall (*12*) for the increase in nonclinical trichinosis. Formerly pork products were usually prepared from one animal. Should the animal have been infected, an epidemic of great severity, but limited to the few consumers, might result. At present, sausages and other pork products are made up by mixing meat from as many as 100 or more hogs. If one of these animals is infected, more people are exposed to infection, but the severity of the infection is necessarily diminished because of the "dilution" of the infected meat.

SEASONAL FLUCTUATION

The 2,968 cases reported to the Public Health Service during the period 1915–1936 were distributed by months as follows:

Month	Number	Percent
January	432	14.5
February	417	14.1
March	354	11.9
April	282	9.5
May	211	7.2
June	126	4.2
July	136	4.6
August	137	4.6
September	160	5.4
October	224	7.5
November	225	7.6
December	264	8.9
Total	2,968	100.0

Figure 2 shows graphically the seasonal fluctuation, with the percentage distribution being plotted on the ordinate axis.

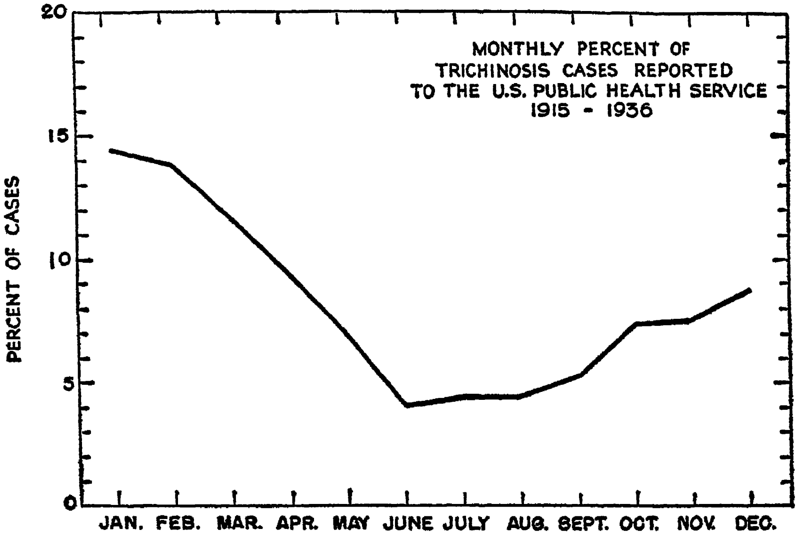

FIGURE 2.

That the seasonal form of this curve (fig. 2), with its peak in winter and its decline in summer, is not accidental can be shown by dividing the data into two periods and plotting separate curves—one for the years 1915–29 and one for 1930–36.

The figures are as follows:

Month	1915-29		1930-36		Month	1915-29		1930-36	
	Number	Percent	Number	Percent		Number	Percent	Number	Percent
January	87	15.0	345	14.4	August	20	3.3	117	4.9
February	93	16.4	324	13.5	September	23	4.2	137	5.7
March	85	15.0	269	11.2	October	19	3.3	205	8.5
April	58	10.2	224	9.3	November	29	5.1	196	8.3
May	29	5.5	182	7.5	December	82	14.4	182	7.6
June	20	3.5	106	4.4					
July	23	4.1	113	4.7	Total	568	100.0	2,400	100.0

Figure 3 shows these percentage incidences graphically.

As pork is the usual source of *Trichinella* infection, the seasonal fluctuation would be explained by assuming that pork consumption in winter is higher than in summer. Unfortunately, there are no figures available showing the number of hogs consumed monthly in the United States or figures on the total number of hogs slaughtered. Through the kind cooperation of Dr. E. C. Joss, of the Bureau of Animal Industry, United States Department of Agriculture, figures have been obtained for hogs slaughtered during the years 1933, 1934, 1935, and 1936, at establishments where Federal meat inspection is maintained in the following States: California, Georgia, Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, New York, Ohio, Oregon, Pennsylvania and Washington. Although these figures do not represent the total amount of pork consumed, they may serve to some degree as an indicator of pork consumption.

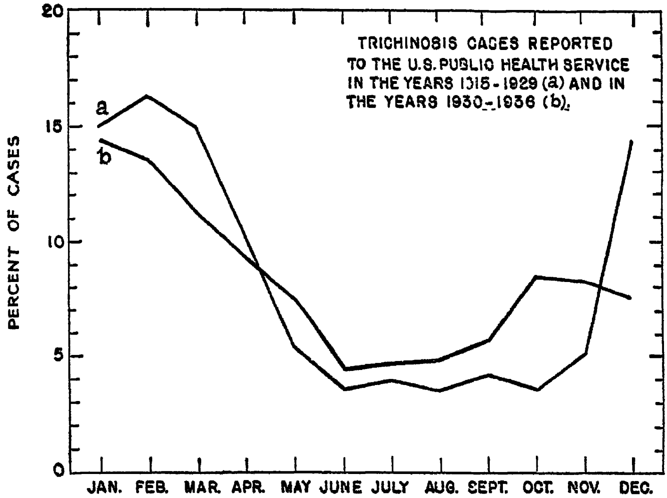

FIGURE 3.

The total number of hogs included in these figures is 115,447,678. The numbers slaughtered by months are as follows:

Month	Number	Percent	Month	Number	Percent
January	11, 945, 786	10.4	July	8, 623, 126	7.4
February	8, 603, 390	7.5	August	7, 240, 571	6.3
March	8, 150, 150	7.1	September	6, 793, 214	5.9
April	8, 588, 363	7.4	October	8, 745, 908	7.6
May	9, 667, 403	8.3	November	11, 344, 898	9.8
June	9, 605, 405	8.3	December	16, 139, 964	14.0

In figure 4 this percentage curve is plotted with the curve representing the number of cases reported monthly to the Public Health Service (fig. 2).

Both curves show a peak in December and January, the pork curve anticipating the curve of human trichinosis. For the small rise in the pork curve in the months of May and June, market prices, prices of feed, seasonal supply of hogs of market age, and many other factors may be responsible.

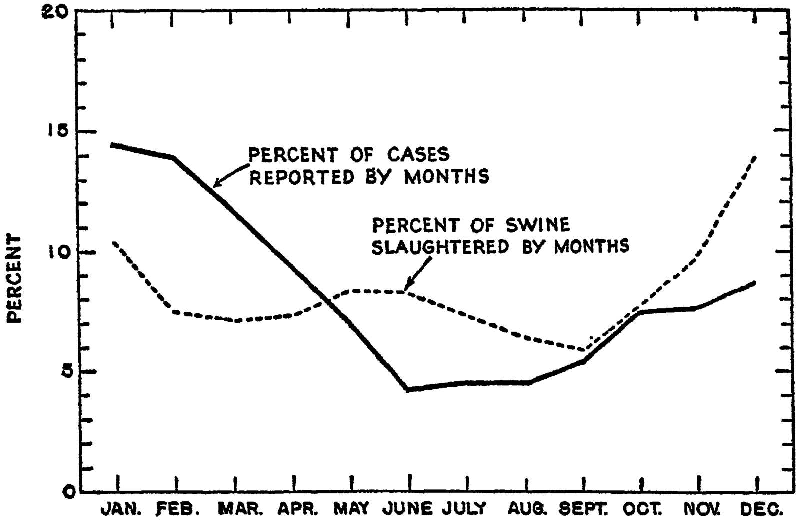

FIGURE 4.

A summary of trichinosis incidence by States is given in table 2. In column 1 is shown whether trichinosis is a notifiable disease in the State, and, if so, when it was made notifiable and whether by law or regulation. In column 2, the figures reported by Ransom (*2*) for the years 1842–1914 are given. In 1842 the first case of trichinosis in the United States was reported by Bowditch (*13*). Seventeen cases, with 4 deaths which were recorded in 1902–1903 in Richland Parish, La., (*14*) omitted by Ransom, have been added by the writer to the figure for the State of Louisiana. In columns 3–10, the figures from table 1 are summarized; column 11 presents the totals. In columns 12–14, the annual average for the years 1930–36 has been found by dividing the total number for the 7 years by 7 and calculating this figure in relation to the population in the respective State in the proportion of 1:1,000,000.

TABLE 2.—*Trichinosis incidence, by States*

State	Reportable disease since—	Cases given by Ransom 1842 to 1914	Clinical cases reported to the U. S. Public Health Service									Average morbidity 1930–36		
			1915 to 1929	1930	1931	1932	1933	1934	1935	1936	Total	Population, census 1930 (revised)	Total 1930 to 1936	Annual rate per 1,000,000
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Alabama	1919 (L)*	----	1	----	----	----	----	----	----	----	1	2,646,248	----	----
Arizona	----	----	----	----	----	----	----	----	----	----	----	435,573	----	----
Arkansas	----	----	----	----	----	----	----	----	----	----	----	1,854,482	----	----
California	1930 (R)*	91	95	143	40	81	51	52	71	40	661	5,677,251	478	12.028
Colorado	1927 (R)	----	1	1	----	----	----	----	----	----	2	1,035,791	1	0.138
Connecticut	1921 (R)	14	87	7	15	11	17	28	19	11	209	1,606,903	108	9.601
Delaware	1931 (R)	----	----	----	----	----	----	----	----	----	----	238,380	----	----
District of Columbia	----	1	----	----	----	----	----	----	----	----	1	486,869	----	----
Florida	1936 (L)	----	8	----	----	----	----	----	----	----	8	1,468,211	----	----
Georgia	1919 (R)	----	14	4	----	----	----	----	1	2	21	2,908,506	7	0 340
Idaho	----	----	----	----	----	----	----	----	----	----	----	445,032	----	----
Illinois	1923 (R)	90	13	6	6	9	16	12	20	9	181	7,630,654	78	1.460
Indiana	----	64	----	----	----	----	----	----	----	----	64	3,238,503	----	----
Iowa	(R) prior to 1931.	48	3	----	1	2	1	11	11	----	77	2,476,939	26	1.500
Kansas	(R) prior to 1917.	----	2	1	----	----	----	----	----	----	3	1,880,999	1	0.076
Kentucky	1927 (R)	----	----	----	----	----	----	----	----	----	----	2,614,589	----	----
Louisiana	----	{ 1 17 }	----	----	----	----	----	----	----	----	18	2,101,593	----	----
Maine	1918 (R)	3	----	----	----	1	----	----	62	----	66	797,123	63	11.292
Maryland	1922 (R)	25	----	1	4	4	3	3	3	7	50	1,631,526	25	2.189
Massachusetts	1893 (L)	145	157	19	13	15	41	46	47	13	496	4,249,614	194	6.522
Michigan	1929 (R)	75	----	----	----	----	2	20	23	38	158	4,842,325	83	2.448
Minnesota	1913 (R)	101	4	17	----	----	1	19	10	----	152	2,563,953	47	2.619
Mississippi	----	----	----	----	----	----	----	----	----	----	----	2,009,821	----	----
Missouri	(R) prior to 1928.	17	----	----	----	----	----	----	----	----	17	3,629,367	----	----
Montana	1921 (R)	----	1	----	----	1	----	1	----	----	3	537,606	2	0.530
Nebraska	----	18	----	----	----	----	----	----	----	----	18	1,377,963	----	----
Nevada	----	----	----	----	----	----	----	----	----	----	----	91,058	----	----
New Hampshire	----	----	----	----	----	----	----	----	----	----	----	465,293	----	----
New Jersey	1895 (L)	35	111	12	10	17	23	39	11	9	267	4,041,334	121	4.277
New Mexico	1922 (R)	----	1	----	----	----	----	----	----	----	1	423,317	----	----
New York	1930 (R)	355	1	----	75	68	132	197	240	172	1,240	12,588,066	884	10.247
North Carolina	----	1	----	----	----	----	----	----	----	----	1	3,170,276	----	----
North Dakota	1913 (R)	----	----	----	----	11	----	----	----	----	11	680,845	11	2.310
Ohio	1928 (R)	70	13	1	2	16	10	8	37	8	165	6,646,697	82	1.784
Oklahoma	----	----	----	----	----	----	----	----	----	----	----	2,396,040	----	----
Oregon	1891 (R)	19	16	----	----	17	1	----	3	----	56	953,789	21	3.147
Pennsylvania	1909 (L)	261	26	50	21	6	14	16	12	14	420	9,631,350	133	1.854
Rhode Island	----	4	----	----	----	----	----	----	7	1	12	687,497	8	1.662
South Carolina	(?)	----	----	----	----	----	----	----	----	----	----	1,738,765	----	----
South Dakota	1913 (R)	19	5	5	2	4	2	1	4	3	45	692,849	21	4.335
Tennessee	1926 (R)	7	----	----	1	----	----	----	----	4	12	2,616,556	5	0.273
Texas	----	14	----	----	----	----	----	----	----	----	14	5,824,715	----	----
Utah	1927 (R)	2	----	----	----	----	----	----	----	----	2	507,847	----	----
Vermont	----	24	----	----	----	----	----	----	----	----	24	359,611	----	----
Virginia	----	8	----	----	----	----	----	----	1	----	9	2,420,851	1	0.059
Washington	1915 (R)	7	9	----	----	----	----	----	----	----	16	1,563,391	----	----
West Virginia	(R) (?)	5	----	----	----	----	----	----	----	----	5	1,729,205	----	----
Wisconsin	----	34	----	----	----	----	----	----	----	----	34	2,939,006	----	----
Wyoming	(R) (?)	----	----	----	----	----	----	----	----	----	----	225,565	----	----
Total	----	1,575	568	267	190	263	314	453	582	331	4,543	----	2,400	----

* R=by regulation. L=by law.

GEOGRAPHIC DISTRIBUTION OF TRICHINOSIS

Figures 5 and 6 are maps of the United States showing the rates of the annual average for the years 1930–36 in proportion to the population for the respective States.

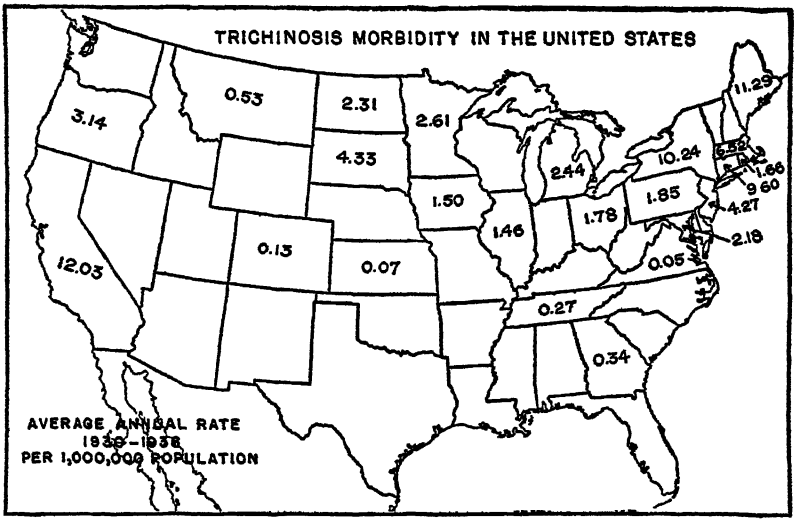

FIGURE 5.

As the reports on which these maps are based are incomplete, the maps give only a rough picture of the true trichinosis situation. Furthermore, those States in which no case was reported to the Public Health Service cannot be considered *Trichinella*-free. Table 3

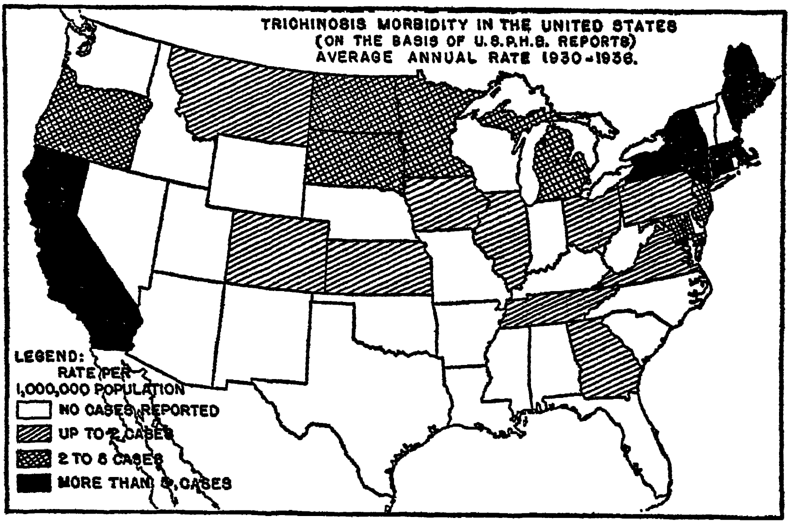
TRICHINOSIS MORBIDITY IN THE UNITED STATES
(ON THE BASIS OF U.S.P.H.S. REPORTS)
AVERAGE ANNUAL RATE 1930–1936.
LEGEND:
RATE PER
1,000,000 POPULATION
NO CASES REPORTED
UP TO 2 CASES
2 TO 6 CASES
MORE THAN 6 CASES

FIGURE 6.

includes all cases recorded in medical literature during 1915–36. It may be seen that there are included records of trichinosis cases not reported to the Public Health Service. The year given is always the year in which the cases occurred.

TABLE 3.—*Clinical cases of trichinosis reported in medical journals, 1915–1936*

State	City	Year	Cases	Deaths	Reference
Arkansas	Pine Bluff	1926	3	1	Pittman, W. G.: J. Arkansas Med. Soc., 23: 109–115 (1926).
California	San Francisco	1916	1	--------	Cummins, W. T., and Carson, G. R.: J. Am. Med. Assoc., 66: 1856–1857 (1916).
	do	1916	15	1	Cummins, W. T., and Carson, G. R.: J. Am. Med. Assoc., 67: 806–808 (1916).
	San Rafael	1918	12	--------	Cumming, J. G.: New York Med. J., 107: 441–443 (1918).
	Palo Alto	1923	1	--------	Thomas, J. B., and Cooper, W.: Am. J. Ophth., 7: 511–512 (1924).
	San Francisco	1926	1	--------	Cheney, G.: J. Am. Med. Assoc., 86: 1004 (1926).
	do	1929	15	--------	Medical News: J. Am. Med. Assoc., 94: 110 (1930).
	--------	1930	151	9	Current Comment: J. Am. Med. Assoc., 95: 40 (1930).
	Vallejo	1931	5	1	Walker, A. T: J. Am. Med. Assoc., 98: 2051–2053 (1932).
	Vallejo, Oakdale, San Francisco.	1931	16	1	Medical News: J. Am. Med. Assoc., 97: 1804 (1931).
	Vallejo, San Francisco	1924 to 1932	(1)	(1)	McCoy, O. R., Miller, J. J., and Friedlander, R. D.: J. Immunol., 24: 1–23 (1933).
Colorado	Denver	1934	12	--------	Stettheimer, C. J.: Colorado Med., 33: 880–887 (1936).
Connecticut	Waterbury	1920	44	1	Alexander, M. E.: Am. J. Med. Sci., 165: 567–577 (1923).
	Hartford	1928	3	--------	Stoll, H. F.: J. Am. Med. Assoc., 92: 701–793 (1929).
	Waterbury	1929	8	1	Foster, J. H.: Proc. Connecticut Med. Soc., 137: 123–137 (1929).
Georgia	--------	1933	1	1	Pund, M. D., and Mosteller, R.: J. Am. Med. Assoc., 102: 1220–1222 (1934).
Illinois	Chicago	1915	1	--------	Bloch, L.: J. Am. Med. Assoc., 65: 2140–2141 (1915).
	do	1915	1	--------	Preble, R. B.: Med. Clin. Chicago, 1: 1163–1171 (1916).
	do	1915	1	--------	Williamson, C. P.: Med. Clin. Chicago, 1: 737–743 (1916).
	do	1916	29	4	Bloch, L.: Ill. Med. J., 29: 369–373 (1916).
	do	1918	3	--------	Meyer, J.: J. Am. Med. Assoc., 70: 588–590 (1918).
	do	1923	1	--------	Grove, J. S.: J. Am. Med. Assoc., 85: 349–350 (1925).
	do	1924	3	1	Hassin, G. B., and Diamond, I. B.: Arch. Neurol. and Psychiat., 15: 34–47 (1926).
	do	1931	4	--------	Birch, C. L.: Med. Clin. North America, 15: 791–796 (1931).
	do	1933	10	4	Medical News: J. Am. Med. Assoc., 101: 146 (1933).
Iowa	--------	1935	24	--------	Kampmeier, R. H.: New Orleans Med. and Surg. J., 88: 448–451 (1936).
Kentucky	Louisville	1930	1	--------	Frazier, H. R.: Kentucky Med. J., 30: 272 (1932).
Louisiana	Shreveport	1929	1	--------	Hargrove, M. D.: Tri-State Med. J., 2: 288–290 (1930)
Maine	--------	1935	56	2	Drake, E. H., Hawkes, R. S., and Warren, M.: J. Am. Med. Assoc., 105: 1340–1343 (1935).
Maryland	Baltimore	1933 1935	15 12	-------- --------	Otto, G. F., and Janney, J. H.: Am. J. Hyg., 25: 76–85 (1937)
	do	1936	55	1	Heathman, L. S.: Am. J. Hyg., 23: 397–409 (1936).

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[1] See Rochester, Williamsville, N. Y.

TABLE 3.—*Clinical cases of trichinosis reported in medical journals, 1915–1936*—Continued

State	City	Year	Cases	Deaths	Reference
Massachusetts	Boston	1922	5	--------	Garland, J.: Boston Med. and Surg. J., 188: 773–776 (1923).
	Lynn	1928	1	1	Horlick, S. S., and Bicknell, R. E.: New Eng. J. Med., 201: 816–819 (1929).
	Boston	1928	1	--------	Cabot case 14292: New Eng. J. Med., 199: 484–486 (1928).
	do	1929	1	--------	Cabot case 15242: New Eng. J. Med., 200: 1257–1259 (1929).
	do	1932	7	--------	Augustine, D. L., and Theiler, H.: Parasitol., 24: 60–86 (1932).
	do	1931 to 1935	7	--------	Morrison, H.: New Eng. J. Med., 213: 531–532 (1935).
	do	1932 to 1935	35	--------	Spink, W. W., and Augustine, D. L.: J. Am. Med. Assoc., 104: 1801–1805 (1935).
	do	1932 to 1935	65	1	Spink, W. W., and Augustine, D. L.: New Eng. J. Med., 213: 527–531 (1935).
	do	1934 to 1935	2	--------	Merritt, H. H., and Rosenbaum, M.: J. Am. Med. Assoc., 106: 1646–1649 (1936).
	do	1935	1	--------	Cabot case 19161: New Eng. J. Med., 208: 847–849 (1935).
	do	1936	35	--------	Spink, W. W.: Arch. Int. Med., 56: 238–249 (1936).
	do	1936	25	--------	Spink, W. W.: New Eng. J. Med., 216: 5–8 (1937).
	do	1936	14	--------	Augustine, D. L.: Am. J. Hyg., 24: 170–176 (1936).
Michigan	Ann Arbor	1924	4	--------	Bettison, W. L.: J. Am. Med. Assoc., 86: 609–613 (1926).
	Benton Harbor	1932	3	1	Sowers, C. N : J. Michigan State M. Soc., 31: 479–481 (1932).
Minnesota	Rochester	1923	1	--------	Magath, T. B.: Minnesota Med., 9: 558–561 (1926).
	do	1933	1	--------	Masson, D. M.: Proc. Staff Meet., Mayo Clin., 8: 701–703 (1933).
Missouri	St. Louis	1914 1916	3	1	Hempelman, L. H.: J. Missouri State M. A., 14: 111–113 (1917).
	do	1929	20	1	Willett, J. C., and Pfau, C. L.: J. Am. Med. Assoc., 94: 1060–1061 (1930).
Nebraska	West Point	1934	46	1	Anderson, A. W.: Nebraska State M. J., 19: 379–382 (1934).
	Pender	1934	2	1	Buis, J.: Nebraska Med. J., 20: 179–180 (1935).
New Jersey	Warren County	1922	34	1	Blanchard, C. K.: Public Health News, 7: 118–123 (1922).
	Newark	1926 to 1929	67	--------	Mancusi-Ungaro, L.: J. Med. Soc. New Jersey, 26: 671–673 (1929).
	Caldwell	1930	3	--------	Halprin, H.: J. Med. Soc. New Jersey, 29: 217–220 (1932).
	Atlantic City	1933	43	1	Kilduffe, R. A., Barbash, S., and Merendino, A. G.: Am. J. Med. Sci., 186: 794–802 (1933).
	Trenton	1934	8	1	Ragany, J.: Med. Rec., 142: 335 (1935).
New York	New York	1915	3	--------	Pratt, E. L.: J. Am. Med. Assoc., 65: 1277 (1915).
	Brooklyn	1916	3	--------	Lintz, W.: J. Am. Med. Assoc., 66: 1856 (1916).
	Far Rockaway	1916	14	--------	Salzer, B. F.: J. Am. Med. Assoc., 67: 579–580 (1916); Med. Rec., 91: 261 (1917).
	New York	1921	7	3	Vance, B. M., and Ryder, M.: Proc. New York Path. Soc., 22: 97–100 (1922).
	Rochester	1924	12	4	Aikman, J.: New York State J. Med., 26: 20–24 (1926).
	Brooklyn	1925	1	1	Moses, H. M.: Long Island Med. J., 20: 7–13 (1926).
	Binghamton	1926	6	--------	Weiss, M.: New York State J. Med., 27: 402–404 (1927).
	New York	1927	1	--------	Key, B. W.: Am. J. Ophth., 12: 178–186 (1929).
	do	1927	1	--------	Salan, J., and Schwartz, B.: J. Am. Med. Assoc., 90: 611 (1928).

TABLE 3.—*Clinical cases of trichinosis reported in medical journals, 1915–1936*—Continued

State	City	Year	Cases	Deaths	Reference
New York	Albany, Mechanicville	1928	43	1	McDonald, E. P. and Waddell, K. C.: J. Am. Med. Assoc., 92: 449–453 (1929).
	Binghamton	1929	5	--------	Weiss, M.: New York State J. Med., 29: 1113–1116 (1929).
		1929	4	--------	Conner, L. A.: Ann. Int. Med., 3: 353–359 (1929).
	Clyde	1930	11	--------	Reifenstein, E. C., Allen, E. G., and Allen, G. S.: Am. J. Med. Sci., 183: 668–678 (1932).
	Williamsport	1931	15	--------	Medical News: J. Am. Med. Assoc., 96: 781 (1931).
		1931	24	--------	Medical News: J. Am. Med. Assoc., 96: 1882 (1931).
	Rochester, Williamsville.	1924 to 1932	[2] 88	[2] 3	McCoy, O. R., Miller, J. J., and Friedlander, R. D.: J. Immunol., 24: 1–23 (1933).
	Staten Island	1932	1	--------	Kenler, M. D., and Silverman, J. J.: New York State J. Med., 33: 752 (1933).
	New York	1929 to 1933	166	3	Frant, S.: Pub. Health Rep., 49: 869–875 (1934).
		1933	8	--------	Goldschlager, A. I.: Ann. Int. Med., 8: 939–950 (1935).
		1933	1	--------	Brooks, H. T.: Med. Rec., 143: 140–142 (1936).
	Brooklyn	1934	6	1	Gordon, M. B., Cares, R., and Kaufman, B.: J. Pediat., 6: 667–675 (1935).
	New York	1934	2	1	Most, H., and Abeles, M. M.: Arch. Neurol. and Psychiat., 37: 589–616 (1937).
	do	1934	2	2	Globus, J. H.: Arch. Neurol. and Psychiat., 37: 614 (1937).
	do	1931 to 1935	8	1	Sobel, I. P.: Am. J. Dis. Child., 51: 367–388 (1936).
	Newark	1933 to 1935	10	--------	Baumgartner, E. A., and Cowles, A.: J. Lab. and Clin. Med., 22: 484–489 (1937).
North Carolina	Durham	1936	1	--------	Hanes, F. M.: Internat. Clin., 4: 67–73 (1936).
Ohio	--------	1928	5 (?)	5	Medical News: J. Am. Med. Assoc., 91: 254 (1928).
	Cleveland	1934	1	--------	Doran, F. J.: Ohio State M. J., 31: 267–268 (1935).
	--------	1928 to 1936	96	8	Hall, A. A.: Ann. Int. Med., 10: 1544–1550 (1937).
Pennsylvania	Pittsburgh	1916	1	--------	Booth, B. A., Goehring, W. N., and Kahn, M.: J. Am. Med. Assoc., 67: 2000 (1916).
	do	1919	10	--------	Maclachlan, W. W. G.: Pennsylvania M. J., 23: 665–667 (1920).
	Philadelphia	1919	1	--------	Carpenter, H. C.: Tr. Am. Pediat. Soc., 31: 184–186 (1919).
	Wayne	1930	29	2	Aldridge, F. C.: Am. J. M. Sc., 181: 812–323 (1931).
	Reading	1930	38	4	Jaisohn, P.: Pennsylvania M. J., 34: 16–17 (1930).
	Philadelphia	1931	1	--------	Kirby, D. W.: Hahneman Monthly, 67: 110–113 (1932).
	do	1931	6	--------	Pepper, O. H. P.: Med. Clin. North America, 15: 271–277 (1931).
	do	1931	1	--------	Pepper, O. H. P.: South Med. and Surg., 94: 415–420 (1932).
Utah	--------	1935	7	--------	Kampmeier, R. H.: New Orleans Med. and Surg., 88: 448–451 (1936).
Virginia	--------	1930	5	1	Swineford, O., and Waddell, W. W.: Virginia Med. Monthly, 59: 28–34 (1932).
Washington	Tacoma	1915	1	--------	McNerthney, J. B., and McNerthney, W. B.: J. Am. Med. Assoc., 67: 1086 (1916).

Totals:

1915–25, 212 cases with 17 deaths, or 8.0 percent mortality.
1926–36, 1,372 cases with 61 deaths, or 4.4 percent mortality.
1915–36, 1,584 cases with 78 deaths, or 4.9 percent mortality.

[2] With cases from California.

POST-MORTEM STATISTICS ON TRICHINELLA INFECTIONS

From tables 2 and 3 it is apparent that between 5,000 and 6,000 trichinosis cases have been diagnosed and reported in the United States since 1842. A very different picture of the incidence of trichinosis is presented if we consider the statistics of *Trichinella* infections found in autopsies. Up to the present time the following autopsy findings have been recorded:

California.—In 1881 Glazier (*15*) reported to the Treasury Department of the United States that Kerber (*16*) in San Francisco found the incidence of trichinosis in 13 autopsies to be zero. No method is given nor is any evidence furnished that trichinellae were really looked for. (Quoted from Williams (*17*).)

In 1936 McNaught and Anderson (*18*) found 48 cases of infection with *Trichinella* in 200 autopsies in San Francisco, an incidence of 24 percent. The method used was the digestion of 50 grams of diaphragm. Twenty-five children found negative were not included in the 200 cases.

Colorado.—In 1901 Williams (*17*) found, in Denver, one case of trichinosis in 10 autopsies, an incidence of 10 percent. Pieces of diaphragm, sternocleido-mastoid, intercostal, rectus abdominis, and psoas magnus muscles were examined microscopically in the compressor.

District of Columbia.—In 1937 Hall and Collins (*19*). using the compressor and digestion method on diaphragm, found 41 positives in 300 autopsies, an incidence of 13.67 percent. These cases include autopsy material from Washington, D. C., and Baltimore, Md.; the number from each is not stated.

Louisiana.—In 1936 Hinman (*14*) found 7 positives in 200 autopsies in New Orleans, an incidence of 3.5 percent. Two square inches of diaphragm were digested.

In 1937 Sawitz (*4*) found 10 trichinous cases in 200 autopsies in New Orleans, an incidence of 5 percent. Fifty grams of diaphragm and 20 grams of pectoral muscle were examined by both the compressor and the digestion method.

Maryland.—In 1898 Osler (*20*) published his findings in 1,000 autopsies in Baltimore and elsewhere. No real survey, however, was made. Osler states that his notes show that in 1,000 consecutive autopsies trichinae were present in 6 instances.

In 1901 Williams (*17*) found an incidence of 3.96 percent in Baltimore in 126 autopsies The compressor method was used in examining diaphragm, sternocleido-mastoid, intercostal, rectus abdominis, and psoas magnus muscles.

In 1937 Hall and Collins (*19*) found 41 positives in 300 autopsies in Baltimore and in Washington, D. C., the number from each not stated, an incidence of 13.67 percent.

Massachusetts.—In 1901 Mallory reported 2 cases of trichinosis in 1,103 autopsies in Boston City Hospital. No especial search was made for the parasites (personal communication from Mallory to Williams (*17*)).

In 1931 Queen (*21*), in 58 autopsies in Boston, found 16 positives, an incidence of 27.6 percent. The method used was the digestion of 50 grams of diaphragm.

Minnesota.—In 1934 Riley and Scheifley (*22*) examined 117 autopsy cases in Minneapolis and found 20 positives, an incidence of 17.09 percent. (In the paper by Riley and Scheifley (*22*) the percentage 17.9 seems to be a misprint.) Diaphragm was examined in the compressor.

In 1937 Magath (*23*) found 17 positives in 220 autopsies in Rochester, an incidence of 7.7 percent. The compressor method was employed, using 2 grams of diaphragm, intercostal, sternocleido-mastoid, and rectus abdominis muscles.

Missouri.—In 1891 Whelpley (*24*) found 1 case of trichinosis in 20 autopsies in St. Louis, an incidence of 5 percent. Microscopic examination was used.

In 1910 Simonds (*25*) found 2 cases of trichinosis in 100 autopsies in the same city, an incidence of 2 percent.

In 1937 Pote (*26*), in 1,037 autopsies in St. Louis by means of more than 12,000 sections of diaphragm, intercostal, pectoral, and rectus abdominis muscles, found 159 positives, an incidence of 15.33 percent.

New Jersey.—In 1881 Glazier (*15*) reported a personal communication from Newark, stating that in 100 autopsies 1 positive case had been found. No real survey was made.

New York.—In 1881 Glazier (*15*) reported that personal communications from pathologists and anatomists of New York showed that in 150 autopsies 3 positives had been found. No real survey was made.

In 1897 Thornbury (*27*), in Buffalo, found microscopically 3 positives in 21 autopsies, an incidence of 14.29 percent.

In 1901 Williams (*17*) examined diaphragm, sternocleido-mastoid, intercostal, rectus abdominis, and psoas magnus muscles in the compressor, in 362 autopsies from Buffalo, and found 21 positive, an incidence of 5.64 percent.

In 1931 Queen (*21*) digested 50 grams of diaphragm of 344 cadavers in Rochester and found 59 trichinous, an incidence of 17.5 percent.

Pennsylvania.—In 1881 Glazier (*15*) reported the findings of pathologists of Philadelphia that, in 40 cadavers, 1 was found positive. No real survey was made.

In 1901 Williams (*17*) found in 7 cadavers in Philadelphia none positive by examining diaphragm, sternocleido-mastoid, intercostal, rectus abdominis, and psoas magnus muscles in the compressor.

Virginia.—In 1881 Glazier (*15*) reported that communications from the University of Virginia indicated that in 150 autopsies 1 trichinous case was found. No real survey was made.

In table 4 only those reports are included in which a real survey for *Trichinella* was made.

TABLE 4.—*Trichinella findings in cadavers in the United States*

Author	Year	Place	Number of cases	Number positive	Percent positive
Whelpley	1891	St. Louis, Mo	20	1	5.0
Thornbury	1897	Buffalo, N. Y	21	3	14.29
Williams	1901	do	362	21	5.64
		Philadelphia, Pa	7	0	0.00
		Baltimore, Md	126	5	3.96
		Denver, Colo	10	1	10.00
Simonds	1910	St. Louis, Mo	100	2	2.0
Queen	1931	Rochester, N. Y	344	59	17.5
		Boston, Mass	58	16	27.6
Riley and Scheifley	1934	Minneapolis, Minn	117	20	17.09
Hinman	1936	New Orleans, La	200	7	3.5
McNaught and Anderson	1936	San Francisco, Calif	200	48	24.0
Hall and Collins	1937	Washington, D. C., Baltimore, Md.	300	41	13.67
Magath	1937	Rochester, Minn	220	17	7.7
Sawitz	1937	New Orleans, La	200	10	5.0
Pote	1937	St. Louis, Mo	1,037	159	15.33
Total			3,322	410	12.34

If we apply this average percentage of 12.34 in post-mortem cases to the living population of 130,000,000 in the United States, 16,000,000 people would be infected with *Trichinella spiralis*, a figure which is higher than is known for any other country throughout the world. It indicates that in the United States *Trichinella spiralis* has already occupied a very extensive human territory and should be considered a serious public health problem.

SUMMARY AND CONCLUSIONS

1. The number of clinical cases of trichinosis reported to the United States Public Health Service for the years 1915–36 (*5*) is 2,968. This figure, together with the 1,575 cases compiled by Ransom (*2*) for the years 1842–1914, indicates that 4,543 cases of trichinosis have been diagnosed and recorded in the United States during 94 elapsed years.

2. Statistically, the yearly incidence of trichinosis has considerably increased in recent years. Since the annual morbidity rate of trichinosis cases for the population for which it was reportable shows a parallel increase, the numerical increase cannot be explained solely by the expansion of the reporting area. Although no new diagnostic method was used during the time concerned, the stimulated interest in the disease might have played a part in the increase in reported cases.

3. The mortality rate for trichinosis cases has decreased from 15.4 percent for 1842–1914 to 4.4 percent for 1926–36, indicating that more mild cases are now diagnosed and reported than formerly. These cases were either formerly overlooked or occur now more frequently. Assuming the latter, an explanation for it could be derived from the fact that nowadays pork products are usually made up from several hogs, and thus a *Trichinella*-infected hog has the chance of infecting more people than formerly, while at the same time the infection is less severe.

4. There is a definite seasonal fluctuation in the occurrence of trichinosis, with the peak in winter and a decline in summer. The explanation that pork consumption is higher in winter than in summer is supported by monthly figures on slaughtered hogs.

5. The geographic distribution of the trichinosis cases shows the highest incidence in the eastern and western parts of the United States.

6. To supplement the trichinosis reports of the United States Public Health Service, a compilation of all cases of trichinosis published in medical journals has been made. The total number of all clinical cases of trichinosis recorded in the United States since 1842 amounts to between 5,000 and 6,000.

7. In post-mortem examinations by various authors and in various parts of the United States, 410 *Trichinella*-infected cases were found

out of 3,322 cases examined, an incidence of 12.34 percent. This average percentage, applied to the living population of the United States, would mean that 16,000,000 people in this country are infected with *Trichinella spiralis.*

REFERENCES

(*1*) Hall, M. C.: Control of animal parasites. General principles and their application. North Am. Vet., Evanston, Ill., 1–162 (1936).

(*2*) Ransom, B. H.: Trichinosis. Rept. 18th Ann. Meet. U. S. Live Stock San. Assoc., 1–19 (1915).

(*3*) Fowler, W.: Laws and regulations relating to morbidity reporting. Supplement No. 100 to the Public Health Reports. U. S. Govt. Printing Office, Washington, D. C. (1933).

(*4*) Sawitz, W.: Are post-mortem statistics on trichinosis valid for the living population? Am. J. Pub. Health, **27:** 1023–1024 (1937).

(*5*) U. S. Public Health Service. Public Health Reports, 1915–1937.

(*6*) Zenker, F. A.: Ueber die Trichinenkrankheit des Menschen. Virchow's Archiv, **18:** 561 (1860).

(*7*) Virchow, R.: Virchow's Archiv, **18:** 535 (1860), quoted from Virchow, R.: Die Lehre von den Trichinen. 3rd edition. Berlin, 1866.

(*8*) Leuckart, R.: Untersuchungen ueber Trichina spiralis. Leipzig and Heidelberg (1860).

(*9*) Brown, T. R.: Studies on trichinosis. Johns Hopkins Hosp. Bull., **8:** 79–81 (1897).

Studies on trichinosis with especial reference to the increase of the eosinophilic cells in the blood and muscle, the origin of these cells and their diagnostic importance. J. Exp. Med., **3:** 315–348 (1898).

(*10*) Bachman, G. W.: A precipitin test in experimental trichinosis. Proc. Inst. of Med. of Chicago, **6:** 240–241 (1927).

A precipitin test in experimental trichiniasis. J. Prev. Med., **2:** 35–48 (1928).

Intradermal reaction in experimental trichiniasis. J. Prev. Med., **2:** 513–523 (1928).

(*11*) Augustine, D. L., and Theiler, H.: Precipitin and skin tests as aids in diagnosing trichinosis. Parasitol., **24:** 60–86 (1932).

(*12*) Hall, M. C.: Studies on trichinosis. Pub. Health Rep., **52** (18): 539–551 (1937); **52** (27): 873–886 (1937).

(*13*) Bowditch, H. I.: Trichina spiralis. Boston Med. and Surg. J., **26:** 117–128 (1842).

(*14*) Hinman, E. H.: Trichiniasis in Louisiana. New Orleans Med. and Surg. J., **88:** 445–448 (1936).

(*15*) Glazier, W. B. H.: Trichinosis and trichinae. Treasury Department Document No. 84, Washington, D. C. (1881).

(*16*) Kerber, cited by Williams (1901).

(*17*) Williams, H. U.: The frequency of trichinosis in the United States. J. Med. Res., **6:** (new series vol. 1) 64–83 (1901).

(*18*) McNaught, J. B., and Anderson, E. V.: The incidence of trichinosis in San Francisco. J. Am. Med. Assoc., **107:** 1446–1448 (1936).

(*19*) Hall, M. C., and Collins, B. J.: Studies on trichinosis. Pub. Health Rep., **52** (16): 468–490 (1937); **52** (17): 512–527 (1937).

(*20*) Osler, Sir William: Principles and practice of medicine. Page 356. 3rd edition. New York, D. Appleton and Co. 1899.

(*21*) Queen, F. B.: The prevalence of human infection with Trichinella spiralis. J. Parasit., **18:** 128 (1931).

(*22*) Riley, W. A., and Scheifley, Ch. H.: Trichinosis of man a common infection. J. Am. Med. Assoc., **102:** 1217–1218 (1934).

(*23*) Magath, T. B.: Encysted trichinae. J. Am. Med. Assoc., **108:** 1964–1967 (1937).

(*24*) Whelpley, H. M.: Trichina spiralis. Am. Monthly Microscop. J., **12:** 217–219 (1891).

(*25*) Simonds, J. P.: Trichinosis. Indianapolis Med. J., **13:** 151–155 (1910).

(*26*) Pote, T. B., Dept. of Pathology, Washington University. St. Louis, Mo.: Unpublished experiments. Personal communication.

(*27*) Thornbury, F. J.: The pathology of trichinosis—original observations. Univ. Med. Mag. (Buffalo), **10:** 64–79 (1897).

A STUDY OF *TRICHINELLA SPIRALIS* IN THE HAWAIIAN ISLANDS [1]

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INTRODUCTION

Trichinella spiralis, a parasite of man and various other mammals, occurring in many parts of the world, was recently shown, by positive biopsy findings, to be present in Hawaii. The finding was made in April 1936, when Dr. W. N. Bergin, on the island of Hawaii, noted symptoms of trichinosis in three patients, and suspected the source of infection to be a locally-made "Portuguese pork-sausage" which the patients had eaten. Dr. Bergin secured a sample of the sausage and submitted it to Dr. E. A. Fennel in Honolulu to be examined for trichinae. Dr. Fennel, in turn, submitted the sausage to the writer, whose examination of it revealed trichina larvae, some of which showed slight motility. Several days later, Dr. Fennel received a section of the gastrocnemius muscle removed at biopsy from one of the three patients, which, on examination, was found to contain trichinae. Mr. Joseph S. Caceres, health officer of the island of Hawaii, ascertained that the suspected pork sausage was made of pork from wild hogs captured in the North Kona District of Hawaii. This finding was also extended by the demonstration of trichinae in wild hogs captured in North Kona; a preliminary report relative to this finding was made by the writer in December 1936 (*1*).

In making inquiries concerning cases of human trichinosis that might have been noted by physicians in the Territory previous to those just mentioned, it was found that two cases had been recognized on the island of Maui in 1930. These diagnoses were made from clinical findings by Dr. F. A. St. Sure, who, in a personal communication, stated: "I have been looking up the records at the hospital [Paia, Maui] and find that we had a case of trichinosis in May 1930. This patient gave a history of having eaten pork sandwiches at a lunch counter on Maui a short time before the onset of his trouble. He had the usual symptoms of the disease. His white blood count was 15,700 with 42 percent eosinophiles. There was another case at the hospital shortly after this and I am having the records of this case looked up." More recently, in January 1936, Dr. Fred Irwin made a clinical diagnosis of this disease in two patients on the island of Hawaii. In March 1936, a nurse, also from Hawaii, developed symptoms of trichinosis. She attributed the source of infection to a locally-manufactured pork product which she had eaten.

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[1] The present survey was conducted through special funds from the Social Security Act appropriation. An abstract of this paper was presented at the meeting of the Territorial Medical Association, Honolulu, T. H., May 1, 1936.

As a consequence of the above findings, studies were conducted by the writer for the Territorial board of health to ascertain the prevalence of trichinae in local hogs and rodents, animals which serve as reservoir hosts for the parasite.

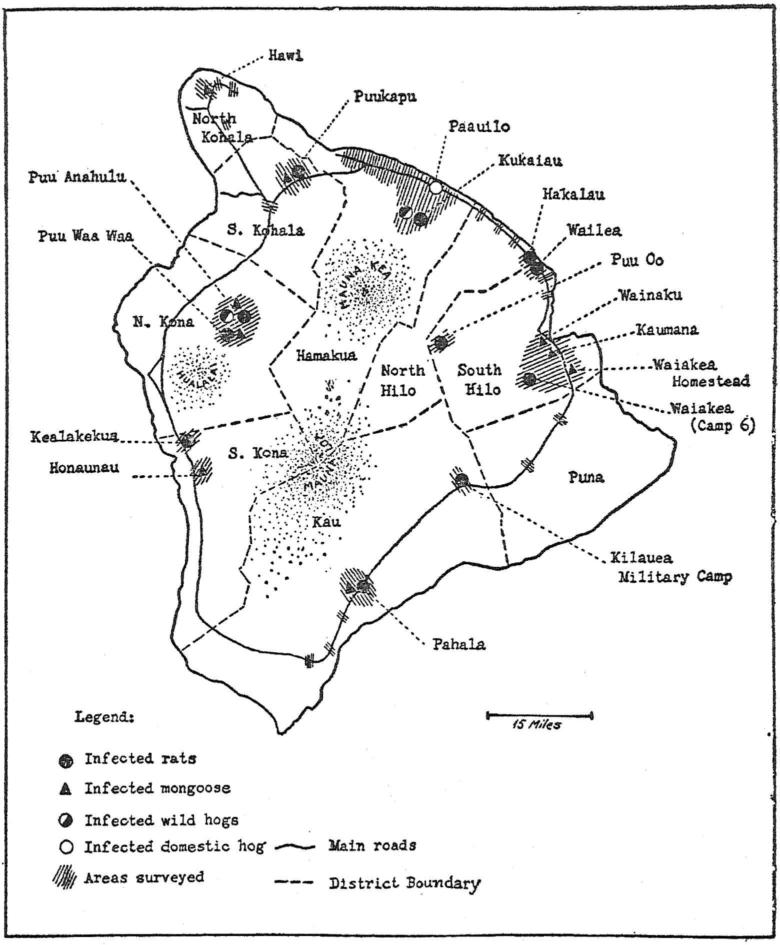

FIGURE 1.—Outline map of the Island of Hawaii showing localities where animals were found infected with trichinae. Shaded portions indicate approximate areas surveyed.

PRESENT SURVEY

1. EXTENT AND METHODS OF INVESTIGATION

The survey, which began on September 9, 1936, and continued up to July 1937, was conducted on the islands of Hawaii, Maui, Oahu, and Kauai. The approximate areas surveyed are shown in figures 1 and 2. The animals which were examined included rats, mice, mongooses (*Mungos birmanicus*), and wild and domestic hogs. The rats, mice, and mongooses were trapped with snap-traps in all sorts of localities, including open fields, sugarcane fields, and areas near slaughter houses, piggeries, and farm buildings. The wild hogs were obtained directly or indirectly from special hunters who captured the animals in various districts as indicated in tables 1 and 2. Specimens of the domesticated hogs were secured in most instances from meat stores and slaughter houses; whenever possible, the actual place where the animal had been raised was ascertained.

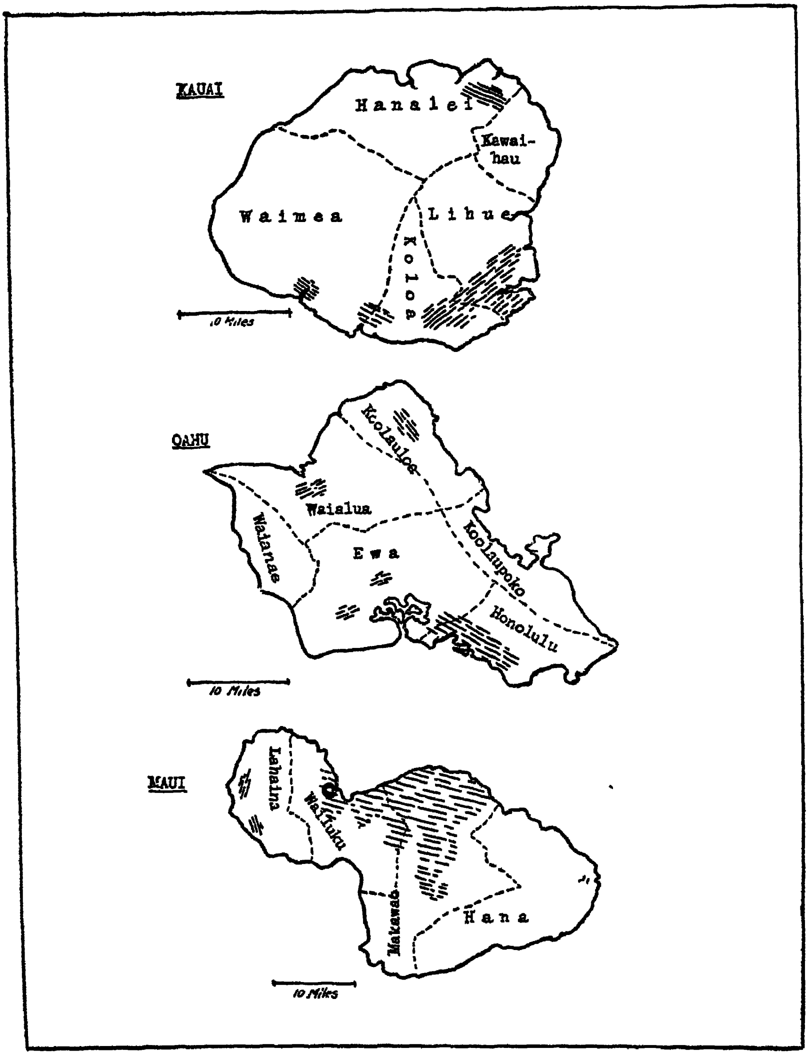

FIGURE 2.—Outline sketches of the Islands of Kauai, Oahu, and Maui, showing the various districts. The shaded portions indicate the approximate areas surveyed for trichinae; the circle indicated in the Wailuku district of Maui shows the locality in which a rat and two mongooses were found infected with trichinae.

2. METHODS OF DIAGNOSIS

In the present investigation, for the most part a combination of the common press preparation and digestion methods was used in examining the muscles of the various animals. In examining rodents and mongooses, the first procedure was the removal of most of the diaphragm and masseter muscles. The diaphragm was spread out and cut in two or three pieces. Each piece was then pressed between two microscope glass slides and examined with both a low-power Spencer binocular microscope, using 12X paired oculars and 2.3X or 4.8X objectives, for detecting encysted larvae, and a compound microscope for detecting unencysted larvae that might be present. Owing to the thinness of the diaphragm of these animals, it was possible to detect easily any encysted larvae. In examining the masseter muscle, it was first cut in several pieces and each piece teased apart to spread out the fibers. These fibers were then pressed between two glass slides and examined as noted above. In case of failure to find trichinae by these methods, the anterior portion of the body of each animal, including the head and thorax, was skinned, and the carcass ground in a meat grinder and digested in an incubator at 37.5° C. in artificial gastric juice (H_2O, 1,000 cc; HCl, 5 cc; pepsin, 7 gm). Each mongoose was digested separately. In the cases of rodents, in order to save time, the head and thorax of five rats of each species from the same locality were mixed and digested together. After digestion for approximately 24 hours, the material was passed through 20- and 40-mesh wire screens to remove particles of bone and undigested material. The filtrate was poured into a 250-cc sedimentation glass cone and allowed to settle. After three washings the sediment was poured in small amounts into small Petri dishes and examined for larvae with a wide-field binocular microscope.

In examining swine, most of the masseter muscle from one side of the head of each hog was used. Pieces of muscle were cut, teased apart, and examined as press preparations. If no larvae were found, the whole masseter muscle was ground and artificially digested as above described.

In comparing the findings by the two methods used, it is of interest to note that no cases of trichinae were discovered with the digestion method that were not discovered with the press preparation method.

3. INCIDENCE OF TRICHINA INFECTION

In tables 1 and 2 are tabulated the results for all the animals examined in each district of the islands surveyed, and the percentage of trichina infection. The data show that trichinae were found in rats, mongooses, and domestic and wild hogs on the island of Hawaii, and in mongooses and rats on the island of Maui. The findings on Hawaii indicate that the parasite is widely distributed, having been found in eight of the nine districts. On Maui the infection seems to be restricted to the north central part of the Wailuku district. For the purpose of clarity, each group of animals will be discussed separately.

TABLE 1.—*Incidence of trichina infection in animals on the island of Hawaii*

District	Rats			Mice			Mongooses			Wild hogs			Domestic hogs		
	Ex.[1]	Pos.[1]	% Pos.	Ex.	Pos.	% Pos.	Ex.	Pos.	% Pos.	Ex.	Pos.	% Pos.	Ex.	Pos.	% Pos.
Hamakua	402	15	3.7	16	0	0	13	0	0	20	3	15	4	1	25
N. Kohala	151	0	0	225	0	0	5	1	20	0	0	0	7	0	0
S. Kohala	51	9	17.6	3	0	0	2	2	100	0	0	0	3	0	0
N. Kona	309	15	4.9	59	0	0	9	2	22.2	11	3	27.2	2	.0	0
S. Kona	219	5	2.3	0	0	0	4	1	25	0	0	0	0	0	0
Kau	162	5	3.1	2	0	0	7	2	28.6	3	0	0	8	0	0
Puna	172	0	0	0	0	0	0	0	0	0	0	0	5	0	0
S. Hilo	450	7	1.5	1	0	0	26	7	26.9	6	0	0	16	0	0
N. Hilo	214	1	.5	0	0	0	4	0	0	0	0	0	2	0	0
Total	2,130	57	-----	306	0	-----	70	15	-----	40	6	-----	47	1	-----
Percent of total	-----	-----	2.7	-----	-----	0	-----	-----	21 4	-----	-----	15	-----	-----	2.1

[1] Ex-Examined; pos-positive.

TABLE 2.—*Incidence of trichina infection in animals on the island of Maui*

District	Rats			Mice			Mongooses			Wild hogs			Domestic hogs		
	Ex.[1]	Pos.[1]	% Pos.	Ex.	Pos.	% Pos.	Ex.	Pos.	% Pos.	Ex.	Pos.	% Pos.	Ex.	Pos.	% Pos.
Wailuku	360	1	0.3	6	0	0	16	2	12.5	0	0	0	32	0	0
Lahaina	62	0	0	2	0	0	0	0	0	0	0	0	26	0	0
Makawao	669	0	0	25	0	0	6	0	0	2	0	0	12	0	0
Hana	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown locality	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0
Total	1,094	1	-----	33	0	-----	22	2	-----	2	0	-----	92	0	-----
Percent of total	-----	-----	.09	-----	-----	0	-----	-----	9.1	-----	-----	0	-----	-----	0

[1] Ex.=Examined; pos.=positive.

A number of animals caught on the islands of Oahu and Kauai were examined, but no trichinae were found. The numbers of each species by districts in which caught are listed in table 3.

TABLE 3.—*Animals on the islands of Oahu and Kauai that were examined for trichina infection*

ISLAND OF OAHU

District	Animals examined				
	Rats	Mice	Mongooses	Wild hogs	Domestic hogs
Honolulu	328	2	1	0	130
Ewa	14	0	0	0	0
Waialua	5	0	0	0	0
Koolauloa	5	0	0	0	0
Total	352	2	1	0	130

ISLAND OF KAUAI

District	Rats	Mice	Mongooses	Wild hogs	Domestic hogs
Hanalei	63	0	0	1	8
Lihue	451	2	0	0	2
Koloa	85	0	0	0	0
Hanapepe	2	0	0	1	17
Unknown	----------	----------	----------	----------	3
Total	601	2	0	2	30

INCIDENCE OF TRICHINAE IN RATS

Of 2,130 rats examined on the island of Hawaii, the average incidence of trichinae was found to be 2.7 percent, although there was a variation from none in the Puna district to 17.6 percent in the South Kohala district. Only one rat was found infected on the island of Maui, and none on Oahu or Kauai. The rats examined included the four species known to be found in Hawaii, and these are mentioned below. Although these rats are found on all the islands surveyed, there was considerable variation in the proportions of species on the various islands and in the various districts of each island. Whenever these different species of rats were more or less evenly distributed in a district or locality, it was planned to examine approximately the same number of each kind.

It is of interest to compare the incidence of trichina infection in the different species of rats on the island of Hawaii, these representing all the species present in the Territory.

Species of rat	Number examined	Number infected	Percent positive
Rattus norvegicus (gray rat)	820	39	4.8
Rattus rattus rattus (black rat)	511	15	2.9
Rattus rattus alexandrinus (alexandrine rat)	397	2	.5
Rattus hawaiiensis (Hawaiian rat)	402	1	.2

Of the total positive rats (57), the percent positive represented by each kind of rat was as follows: Gray rat, 68.4 percent; black rat, 26.3 percent; alexandrine rat, 3.5 percent; Hawaiian rat, 1 percent.

HABITS OF RODENTS IN RELATION TO TRICHINOSIS

The incidence of trichina infection in the various species of rats may bear a relationship to their habits of living and feeding, or possibly may be accounted for by the frequency of certain species in an endemic area. For example, in the North Kona district of Hawaii the majority of rats trapped were black rats, and most of the positive rats were of this kind, presumably because of their frequency.

In regard to the habits of rats in Hawaii, a considerable discussion is given by Eskey (*2*) in connection with other subjects relative to a study of plague in Hawaii. *R. norvegicus*, although usually believed to be found in or near buildings, is in some localities, as on Kauai, the most common rat in the fields. Of 39 rats of this species found infected, 14 were trapped near slaughter houses and piggeries, especially in the South Kohala district. The other 25 were trapped mostly in the Kukaiau section of the Hamakua district near ranch buildings.

The two subspecies of *Rattus rattus* are known to live afield and nest in trees and at times under floors; they also frequent buildings. Of the 17 rats of this group found infected, all were trapped in open fields, mostly in the North Kona district, where wild pigs also were found infected.

Of the *R. hawaiiensis* examined, only one, trapped under a house in a village in the South Hilo district, was found infected. This species of rat is usually considered a field type, nesting in underground burrows or rock piles, and is rarely found in buildings or very close to them. Their food is believed to be mainly seeds and fruits.

Of the rats examined on Maui, the only rat (*R. rattus alexandrinus*) found infected with trichinae was trapped about 2 miles north of the town of Wailuku. In this area, there were found also 2 infected mongooses; and out of 179 additional rats trapped, none showed trichina larvae.

Of all the mice (*Mus musculus*) examined in the various islands, none was found positive for trichinae. These mice are known to frequent both buildings and open fields.

INCIDENCE OF TRICHINAE IN MONGOOSES

Table 1 shows that trichina infection in mongooses on Hawaii was found in all eight districts in which rats were found infected. Of 70 mongooses examined, 15 (21.4 percent) were positive. On Maui only 2 mongooses were found infected. The percentage of positive mongooses on Hawaii (21.4 percent) appears very high when compared with that of rats (2.7 percent). The high incidence is probably due to the feeding habits of the mongooses. These animals are believed to prey extensively on rodents and consequently are very likely to become infected from diseased rats. Except in South Kohala, where the number is too small to afford a significant incidence, there is apparently little difference in the percentage of infection in mongooses in those districts in which trichinae were found, varying only from 20 to 28.6 percent. In South Kohala only two animals were examined and both were infected, the indicated high incidence being in line with a high incidence in rats in that area.

INCIDENCE OF TRICHINAE IN WILD HOGS

The "wild hogs" found in the Territory are descended, it is believed, from domesticated swine (*Sus scrofa domestica*) which escaped and now roam wild in the mountainous, swampy, or waste lands on many of the islands. Wild hogs were caught in four districts on the island of Hawaii, and in two of these districts infection was found, namely, the Kukaiau section of the northeast portion of the Hamakua district, with 15 percent infection, and the Puuanahulu section of North Kona district, with 27.2 percent infection. However, in the Kau and South Hilo districts the number of hogs examined was small, and a more extensive survey would probably reveal the presence of trichinae. No trichinae were found in two wild hogs captured in the Makawao District on the island of Maui, and in one from Hanalei and one from Waimea on Kauai.

The source of trichina infection in wild hogs is not definitely known, but possibly they become infected as a result of eating diseased carcasses of other hogs, rats, or other carnivorous mammals. Hogs under domestication are known to feed occasionally on carcasses of animals that die on the farm, and this habit may be more common in their wild state.

In view of the high incidence of infection among wild hogs, and of the large numbers of these animals which are used for human consumption in Hawaii, it is believed that wild swine may be of considerable importance in connection with trichinosis here. In this connection we note that three cases of trichinosis in man on Hawaii, in 1936, were attributed to pork sausage made from wild hogs. According to personal information furnished by Mr. L. W. Bryan, Forester for the island of Hawaii (Board of Commissioners of Agriculture and Forestry), there were, during the 5-year period ending December 31, 1935, a total of 11,088 wild hogs reported killed on that island. Undoubtedly other hogs were killed that were not reported. The hogs in this survey were obtained from all sections of the island, but principally from the Kohala Forest Reserve (North Kohala district), and along the slopes of the Mauna Kea, Mauna Loa, and Hualalai mountains. In these areas, hogs are usually present below the timber line, which varies from about 8,000 to 10,000 feet above sea level.

INCIDENCE OF TRICHINAE IN DOMESTICATED HOGS

Of 41 muscle samples from domesticated hogs examined for trichinae on the island of Hawaii, only one, obtained in the Hamakua district, was found positive. In 92, 130, and 30 hogs examined from Maui, Oahu, and Kauai, respectively, no trichinae were found.

The above data indicate a low incidence of trichina infection in domesticated hogs. This low incidence is in line with certain proper swine-feeding practices followed by many swine raisers. Hog raising in Hawaii is for the most part a very intensive form of agriculture. In most cases, hogs are kept in concrete or wooden pens, and are fed to a great extent on garbage which is secured from army posts, hotels, and households; the garbage is cooked before being fed to the swine, and this procedure, if properly conducted, should kill any trichina larvae that may be present in meat scraps. It is of interest to point out, in this connection, that the feeding of uncooked garbage to hogs in the continental United States is claimed to be an important factor in the spread of trichinosis to swine. Hall (*3*) reported that of 2,146 samples of pork from grain-fed hogs and of 1,973 garbage-fed hogs, 1.5 percent and 4.8 percent, respectively, were found infected with trichinae. Schwartz (*4*) also reports approximately the same percentage infection in hogs.

TRICHINOSIS IN MAN IN THE TERRITORY OF HAWAII

A summary of cases of trichinosis in man which have been reported in the Territory of Hawaii up to July 1937 is presented below. Except as otherwise indicated, these cases were reported to the Territorial Board of Health by physicians:

Case number	Date known or reported	Island on which reported	Basis of diagnosis	Attributed source of infection	Physician reporting
1	May 1930	Maui	Clinical	Pork	Dr. F. A. St. Sure.
2	(?) 1930	do	do	(?)	Do.
3	January 1936	Hawaii	do	Pork	Dr F. Irwin.
4	do	do	do	do	Do.
5	March 1936	do	do	Portuguese sausage	
6	Apr. 27, 1936	do	do	Portuguese sausage (wild hogs).	Dr. W. N. Bergin.
7	do	do	do	do	Do.
8	May 6, 1936	do	Trichina larvae in muscle.	do	Do.
9	Aug. 31, 1936	Maui	Clinical	Portuguese sausage	Dr. H. W. Chamberlin.
10	Nov. 21, 1936	Hawaii	Trichina larvae in muscle.	(?)	Dr. O. Orenstein.
11	June 1937	Maui	do	Pork	Dr. F. A. St. Sure.

Cases 1, 2, 3, 4, 5, and 11 were reported to the writer. Case 5 was diagnosed by the patient herself, who is a nurse; the patient noted clinical symptoms on Mar. 3, 1936, with an eosinophilia of 12 percent on March 17, and 45 percent on April 1.

SUMMARY AND DISCUSSION

The present survey has shown that trichinae are present in the rat, mongoose, and wild and domestic hog on the island of Hawaii, and in the mongoose and rat on the island of Maui. The data obtained are too incomplete in some instances to warrant the statement that trichinae are not present in other districts.

In addition to the findings in the present survey, 11 cases of human trichinosis have been reported, mostly by physicians, from the islands of Maui and Hawaii; the infection in some of these cases was attributed to the eating of pork or of a locally manufactured pork sausage.

So far as human trichinosis is concerned, man usually acquires it as a result of eating the fresh muscle of infected swine; therefore, in order to control human trichinosis, in addition to cooking pork properly, it is essential to prevent hogs from becoming infected so as to reduce the source of infection. Just what part rats and mongooses play in the spread of trichinosis to swine is not definitely known. Hall (*5*) is of the opinion that rats are not of much importance in the spread of trichinosis to domestic swine, but that swine usually become infected through eating infected pork scraps present in garbage. Although this is undoubtedly true for swine raised under domestication, wild hogs probably perpetuate the disease by cannibalism.

The presence of trichinae in hogs, both domestic and wild, constitutes a public health menace, and it is well to emphasize certain precautionary measures; namely, (*a*) Swine sanitation, involving among other things the thorough cooking of garbage to be fed to hogs so as to destroy any trichina larvae, and keeping hogs in ratproofed pens; (*b*) special slaughterhouse cooking, refrigerating, or processing of pork products of a kind customarily eaten without being cooked by the consumer; (*c*) thorough cooking of pork from domestic or wild swine before it is eaten.

It may well be emphasized, as Hall and Collins (*6*) have stated, that the fact that trichinosis is found in man "is not a reason for not eating pork, but it is a reason for cooking it well." According to reports by the United States Department of Agriculture, pork is rich in protein, fat, and vitamin B, and is easily digested; therefore, it is to be regarded as a desirable food.

ACKNOWLEDGMENTS

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REFERENCES

(*1*) Alicata, J. E.: Parasites of pigs and horses. *In* Report of the Hawaii Agricultural Experiment Station, 1936, pp. 82, 83. U. S. Dept. of Agriculture.

(*2*) Eskey, C. R.: Epidemiological study of plague in the Hawaiian Islands. Pub. Health Bull. No. 213, U. S. Public Health Service. Government Printing Office, Washington, D. C., 1934.

(*3*) Hall, M. C.: Zoological Division. *In* Report of the Chief of the Bureau of Animal Industry, 1935, U. S. Dept. Agric., pp. 48–55.

(*4*) Schwartz, B.: Zoological Division. *In* Report of the Chief of the Bureau of Animal Industry, 1936, U. S. Dept. Agric., pp. 53–60.

(*5*) Hall, M. C.: Studies on trichinosis. IV. The role of the garbage-fed hog in the production of trichinosis. Pub. Health Rep., **52:** 873–886 (July 2, 1937).

(*6*) Hall, M. C., and Collins, B. J.: Studies on trichinosis. I. The incidence of trichinosis as indicated by post-mortem examination of 300 diaphragms. Pub. Health Rep., **52:** 468–490 (Apr. 16, 1937).

DEATHS DURING WEEK ENDED FEBRUARY 19, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Feb. 19, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	8,611	[1] 10,403
Average for 3 prior years	9,841	
Total deaths, first 7 weeks of year	63,127	75,579
Deaths under 1 year of age	522	[1] 656
Average for 3 prior years	591	
Deaths under 1 year of age, first 7 weeks of year	3,747	4,537
Data from industrial insurance companies:		
Policies in force	69,776,044	69,207,100
Number of death claims	13,926	16,541
Death claims per 1,000 policies in force, annual rate	10.4	12.5
Death claims per 1,000 policies, first 7 weeks of year, annual rate	10.2	11.6

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[1] Data for 85 cities.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (------) indicate that cases or deaths may have occurred although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 26, 1938, and Feb. 27, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 26, 1938	Week ended Feb. 27, 1937	Week ended Feb. 26, 1938	Week ended Feb. 27, 1937	Week ended Feb. 26, 1938	Week ended Feb. 27, 1937	Week ended Feb. 26, 1938	Week ended Feb. 27, 1937
New England States:								
Maine	1	0	5	212	44	6	1	0
New Hampshire	0	1	4	------	23	76	0	0
Vermont	1	0	------	------	172	------	0	0
Massachusetts	0	4	------	------	245	768	2	4
Rhode Island	0	1	------	------	3	201	1	2
Connecticut	3	2	5	169	20	474	0	2
Middle Atlantic States:								
New York	26	31	[1] 6	[1] 45	1,273	439	8	11
New Jersey	18	9	24	134	1,253	1,190	1	6
Pennsylvania	63	45	------	------	7,166	219	6	7
East North Central States:								
Ohio	36	38	------	447	2,591	99	7	13
Indiana	81	9	19	133	740	11	0	3
Illinois	29	37	23	162	6,495	36	2	7
Michigan [2]	15	16	2	4	3,448	52	2	2
Wisconsin	4	1	57	220	3,476	14	1	1
West North Central States:								
Minnesota	1	6	1	1	35	32	0	2
Iowa	2	2	14	8	66	2	2	0
Missouri	29	19	175	944	1,073	8	4	3
North Dakota	1	1	6	7	3	2	0	0
South Dakota	0	1	------	9	------	------	0	1
Nebraska	11	5	14	30	33	13	1	0
Kansas	4	9	8	------	322	6	0	0
South Atlantic States:								
Delaware	0	1	------	7	21	76	0	0
Maryland [2]	5	8	28	372	48	554	7	2
District of Columbia	10	10	------	28	4	75	0	1
Virginia	18	14	------	------	456	269	0	14
West Virginia	8	14	69	1,252	439	1	3	10
North Carolina	25	25	16	173	2,662	64	2	3
South Carolina [3]	4	------	604	1,346	559	54	2	2
Georgia [3]	8	8	------	1,262	419	------	0	3
Florida	7	9	------	35	564	5	1	0
East South Central States:								
Kentucky	9	13	43	493	698	243	9	17
Tennessee	12	11	152	844	1,520	10	9	10
Alabama [3]	18	37	316	1,546	1,172	26	12	8
Mississippi [3]	6	7	------	------	0	------	1	2

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 26, 1938, and Feb. 27, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 26, 1938	Week ended Feb. 27, 1937	Week ended Feb. 26, 1938	Week ended Feb. 27, 1937	Week ended Feb. 26, 1938	Week ended Feb. 27, 1937	Week ended Feb. 26, 1938	Week ended Feb. 27, 1937
West South Central States:								
Arkansas	9	11	154	980	346	-------	1	3
Louisiana	15	12	9	389	5	8	2	2
Oklahoma [4]	8	7	218	974	83	12	1	7
Texas	38	29	754	3,480	322	310	6	14
Mountain States:								
Montana	3	2	-------	132	30	2	1	0
Idaho	0	2	7	67	4	34	1	1
Wyoming	2	0	-------	50	3	2	0	0
Colorado	27	6	-------	-------	518	6	2	1
New Mexico	1	4	2	167	81	62	0	0
Arizona	8	5	101	269	16	239	0	2
Utah [3]	0	0	-------	-------	178	26	0	0
Pacific States:								
Washington	1	4	1	5	7	43	1	0
Oregon	2	1	84	196	15	7	0	1
California	34	21	110	1,915	252	110	2	13
Total	603	498	3,031	18,507	38,903	5,886	101	180
First 8 weeks of year	5,197	4,584	24,618	209,415	201,876	37,714	755	1,247

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Feb 26, 1938	Week ended Feb. 27, 1937	Week ended Feb. 26, 1938	Week ended Feb. 27, 1937	Week ended Feb. 26, 1938	Week ended Feb. 27, 1937	Week ended Feb. 26, 1938	Week ended Feb. 27, 1937	Week ended Feb. 26, 1938
New England States:									
Maine	0	0	18	15	0	0	0	0	27
New Hampshire	0	0	18	23	0	0	2	0	4
Vermont	0	0	28	10	0	0	0	0	46
Massachusetts	0	0	299	255	0	0	1	1	84
Rhode Island	1	0	16	56	0	0	0	0	39
Connecticut	0	0	107	88	0	0	0	2	49
Middle Atlantic States:									
New York	1	0	740	953	0	4	5	2	410
New Jersey	0	0	136	174	0	0	0	1	166
Pennsylvania	2	0	610	561	0	0	5	8	205
East North Central States:									
Ohio	0	1	482	493	37	7	7	3	169
Indiana	1	1	270	216	47	8	2	0	25
Illinois	1	1	736	582	41	40	13	4	85
Michigan [3]	1	0	594	771	11	3	4	1	197
Wisconsin	0	0	214	349	7	4	1	1	136
West North Central States:									
Minnesota	0	0	171	169	16	2	0	1	27
Iowa	0	2	266	351	53	85	0	0	24
Missouri	0	0	218	292	52	46	4	0	125
North Dakota	0	0	18	47	15	22	0	1	0
South Dakota	0	0	11	73	4	5	0	1	70
Nebraska	0	0	94	106	8	0	1	0	14
Kansas	0	0	209	378	31	22	0	1	93
South Atlantic States:									
Delaware	0	0	16	4	0	0	0	1	5
Maryland [3]	0	0	62	51	0	0	0	1	48
District of Columbia	1	0	18	21	0	0	1	1	4
Virginia	0	0	35	35	0	0	4	1	89
West Virginia	1	0	44	55	0	0	5	8	88
North Carolina	2	1	52	33	0	0	5	8	383
South Carolina [3]	0	0	5	6	0	0	4	3	68
Georgia [3]	0	0	13	14	0	0	1	2	43
Florida	1	2	9	6	1	0	2	1	14

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Feb. 26, 1938, and Feb. 27, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Feb. 26, 1938	Week ended Feb. 27, 1937	Week ended Feb. 26, 1938	Week ended Feb. 27, 1937	Week ended Feb. 26, 1938	Week ended Feb. 27, 1937	Week ended Feb. 26, 1938	Week ended Feb. 27, 1937	Week ended Feb. 27, 1938
East South Central States:									
Kentucky	0	0	97	65	21	0	3	2	67
Tennessee	0	0	62	18	32	0	1	4	86
Alabama [3]	2	2	7	12	0	0	4	1	32
Mississippi [2]	2	0	9	12	6	0	2	2	--------
West South Central States:									
Arkansas	2	0	9	11	6	5	1	0	26
Louisiana	0	1	13	14	0	0	25	6	12
Oklahoma [4]	0	2	20	41	20	6	0	0	41
Texas	2	1	124	77	20	2	12	20	177
Mountain States:									
Montana	0	0	26	47	21	29	0	0	24
Idaho	0	0	19	25	16	1	0	0	12
Wyoming	0	0	6	36	0	3	0	0	4
Colorado	0	0	73	45	14	1	0	0	15
New Mexico	2	0	24	35	0	0	7	0	31
Arizona	0	0	12	16	10	0	0	1	43
Utah [2]	0	0	49	23	1	0	0	0	23
Pacific States:									
Washington	1	0	57	63	51	5	1	2	138
Oregon	0	1	58	23	21	24	2	0	26
California	1	0	184	219	17	9	11	1	363
Total	24	15	6,358	6,969	579	283	136	82	3,947
First 8 weeks of year	174	174	48,076	50,571	4,650	2,364	986	885	31,816

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[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Feb. 26, 1938, 7 cases as follows: South Carolina, 1; Georgia, 4; Alabama, 2.
[4] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
January 1938										
Colorado	1	43	1	--------	779	--------	0	191	48	0
Idaho	2	6	17	--------	24	--------	1	141	142	7
Indiana	6	295	109	--------	1,481	--------	1	953	259	5
Louisiana	12	54	123	25	13	4	3	74	3	27
Massachusetts	3	17	--------	1	566	--------	0	1,163	0	7
Mississippi	5	28	7,217	943	642	173	2	39	43	8
Montana	2	3	51	--------	21	--------	1	178	39	3
Nevada	0	0	33	--------	1	--------	0	20	0	1
New Mexico	3	14	7	--------	558	--------	1	75	8	7
New York	29	129	--------	4	1,758	--------	6	2,516	0	18
Oklahoma	8	102	705	34	113	3	2	270	74	12
Oregon	2	15	212	--------	44	--------	4	233	82	6
Pennsylvania	26	216	--------	4	22,303	1	2	2,222	0	34
Puerto Rico	0	44	99	4,340	63	--------	0	--------	0	35
Rhode Island	0	--------	--------	--------	2	--------	0	149	0	0
South Dakota	2	19	14	--------	9	--------	0	115	39	0
Texas	7	306	2,949	178	322	112	6	650	77	76
Vermont	0	1	8	--------	1,219	--------	0	69	0	0
Virginia	16	82	2,002	3	1,495	6	0	196	1	13

Summary of monthly reports from States—Continued

January 1938

	Cases
Anthrax:	
Texas	4
Chickenpox:	
Colorado	487
Idaho	220
Indiana	507
Louisiana	48
Massachusetts	2, 196
Mississippi	804
Montana	300
Nevada	28
New Mexico	191
New York	3, 361
Oklahoma	294
Oregon	375
Pennsylvania	5, 719
Puerto Rico	13
Rhode Island	129
South Dakota	231
Texas	1, 072
Vermont	371
Virginia	373
Conjunctivitis:	
Idaho	6
New Mexico	3
Oklahoma	1
Dengue:	
Mississippi	4
Texas	29
Diarrhea:	
New Mexico	7
Dysentery:	
Louisiana (amoebic)	1
Massachusetts (bacillary)	6
Mississippi (amoebic)	46
Mississippi (bacillary)	220
New York (amoebic)	6
New York (bacillary)	99
Oklahoma (amoebic)	1
Oklahoma (bacillary)	7
Oregon (amoebic)	1
Pennsylvania (amoebic)	1
Puerto Rico	31
Texas (amoebic)	4
Texas (bacillary)	44
Virginia (diarrhea included)	41
Encephalitis, epidemic or lethargic:	
Montana	1
New York	5
Oregon	2
Pennsylvania	2
Rhode Island	1
Texas	5
Virginia	1
Filariasis:	
Puerto Rico	2
Food poisoning:	
New Mexico	1
German measles:	
Idaho	4
Massachusetts	57
Montana	8
New Mexico	1
New York	104
Pennsylvania	168
German measles—Contd.	
Rhode Island	7
Vermont	10
Hookworm disease:	
Louisiana	11
Mississippi	371
Impetigo contagiosa:	
Montana	3
Oregon	116
Jaundice, infectious:	
Montana	18
Oregon	1
Lead poisoning:	
Massachusetts	1
Mumps:	
Colorado	32
Idaho	327
Indiana	27
Louisiana	4
Massachusetts	618
Mississippi	275
Montana	96
Nevada	163
New Mexico	121
Oklahoma	14
Oregon	55
Pennsylvania	3, 640
Puerto Rico	2
Rhode Island	30
South Dakota	65
Texas	232
Vermont	629
Virginia	229
Ophthalmia neonatorum:	
Louisiana	1
Massachusetts	75
Mississippi	8
New York [1]	11
Oklahoma	1
Pennsylvania	3
Puerto Rico	8
Virginia	1
Paratyphoid fever:	
Massachusetts	1
New York	3
Texas	2
Virginia	1
Puerperal septicemia:	
Mississippi	29
Puerto Rico	3
Rabies in animals:	
Indiana	62
Louisiana	11
Massachusetts	11
Mississippi	14
New York [1]	2
Oregon	4
Rhode Island	2
Rabies in man: Virginia	1
Scabies:	
Montana	3
Oregon	74
Septic sore throat:	
Idaho	32
Louisiana	30
Massachusetts	26
Montana	9
New Mexico	1
New York	110
Septic sore throat—Contd.	
Oklahoma	23
Oregon	10
Rhode Island	18
South Dakota	1
Tetanus:	
Louisiana	2
New York	2
Puerto Rico	8
Virginia	2
Tetanus, infantile:	
Puerto Rico	2
Trachoma:	
Mississippi	3
Montana	58
Oklahoma	27
South Dakota	1
Trichinosis:	
Massachusetts	3
New York	25
Tularaemia:	
Indiana	6
Louisiana	7
Nevada	1
New Mexico	1
Pennsylvania	2
Texas	3
Virginia	14
Typhus fever:	
Louisiana	3
Texas	31
Undulant fever:	
Colorado	1
Idaho	2
Indiana	1
Louisiana	4
Massachusetts	2
Mississippi	6
Montana	2
New York	15
Oklahoma	94
Oregon	2
Pennsylvania	6
Texas	10
Virginia	5
Vincent's infection:	
New York [1]	68
Oklahoma	4
Oregon	13
Whooping cough:	
Colorado	35
Idaho	133
Indiana	121
Louisiana	15
Massachusetts	599
Mississippi	604
Montana	131
Nevada	26
New Mexico	147
New York	1, 618
Oklahoma	121
Oregon	73
Pennsylvania	1, 303
Puerto Rico	181
Rhode Island	187
South Dakota	98
Texas	765
Vermont	132
Virginia	476

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[1] Exclusive of New York City.

WEEKLY REPORTS FROM CITIES

City reports for week ended Feb. 19, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	208	1,111	161	4,556	1,001	2,187	25	419	19	1,176	--------
Current week [1]	142	185	66	12,470	740	1,719	39	316	15	1,089	--------
Maine:											
Portland	0	------	0	7	3	1	0	0	0	23	37
New Hampshire:											
Concord	0	------	0	1	0	0	0	0	0	2	14
Manchester	0	------	0	0	6	0	0	0	0	0	28
Nashua	0	------	1	4	0	0	0	0	0	4	3
Vermont:											
Barre	------	------	------	------	------	------	------	------	------	------	------
Burlington	0	------	0	7	0	1	0	0	0	6	7
Rutland	0	------	0	0	0	0	0	0	0	0	4
Massachusetts:											
Boston	1	------	1	144	17	98	0	6	0	14	206
Fall River	0	------	0	0	2	1	0	0	0	10	29
Springfield	0	------	0	0	3	7	0	0	0	7	38
Worcester	0	------	0	1	12	30	0	2	0	6	54
Rhode Island:											
Pawtucket	1	------	0	0	2	5	0	0	0	0	13
Providence	0	------	1	1	2	10	0	1	0	25	58
Connecticut:											
Bridgeport	0	1	0	0	2	28	0	1	0	1	36
Hartford	0	3	0	0	4	17	0	0	0	6	39
New Haven	0	5	1	0	3	2	0	0	0	2	47
New York:											
Buffalo	0	------	0	1	9	24	0	7	1	16	124
New York	31	24	8	527	133	368	0	75	3	271	1,474
Rochester	0	2	0	1	1	13	0	0	0	6	65
Syracuse	1	------	0	10	6	11	0	2	0	13	59
New Jersey:											
Camden	1	1	1	38	4	1	0	1	0	1	32
Newark	0	1	1	22	7	11	0	2	0	39	117
Trenton	0	1	1	8	2	1	0	4	0	3	38
Pennsylvania:											
Philadelphia	2	------	5	715	31	125	0	28	0	47	510
Pittsburgh	6	5	3	414	27	47	0	8	0	21	193
Reading	1	0	0	3	3	5	0	0	0	1	40
Scranton	1	------	------	68	------	4	0	------	0	4	------
Ohio:											
Cincinnati	1	------	2	4	12	9	0	7	0	6	134
Cleveland	1	17	2	176	15	78	0	7	1	35	174
Columbus	0	------	0	229	5	7	0	1	0	0	83
Toledo	0	------	0	132	4	8	0	4	0	9	72
Indiana:											
Anderson	0	------	0	3	0	4	7	0	0	0	9
Fort Wayne	2	------	0	39	4	14	0	0	1	1	25
Indianapolis	10	------	1	99	16	17	0	4	0	1	98
Muncie	1	------	------	53	0	1	2	0	0	0	15
South Bend	1	------	0	8	0	1	1	0	0	0	16
Terre Haute	4	------	0	22	0	3	0	0	0	0	18
Illinois:											
Alton	0	------	------	0	3	10	0	0	0	0	11
Chicago	9	11	5	3,116	46	227	0	32	2	35	699
Moline	0	1	0	67	2	15	0	0	0	0	9
Springfield	1	------	0	128	3	3	2	0	0	2	14
Michigan:											
Detroit	9	------	3	2,029	14	154	0	16	0	53	263
Flint	2	------	0	1	2	31	0	0	0	11	20
Grand Rapids	0	------	1	1	2	12	0	0	0	1	27
Wisconsin:											
Kenosha	0	------	0	11	3	0	0	0	0	1	13
Madison	1	------	1	1	1	9	0	0	0	5	15
Milwaukee	0	------	0	2,636	11	15	0	2	0	12	110
Racine	1	------	0	18	1	9	0	2	0	4	18
Superior	0	------	0	1	0	1	0	0	0	1	7

[1] Figures for Barre, Vt., estimated; report not received.

City reports for week ended Feb. 19, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	0	0	2	2	0	0	0	2	23
Minneapolis	0	------	1	9	5	28	0	0	0	7	92
St. Paul	0	1	0	1	4	8	3	2	0	1	60
Iowa:											
Cedar Rapids	0	------	------	1	------	0	0	------	0	1	------
Davenport	0	------	------	12	------	0	0	------	0	0	------
Des Moines	0	------	------	1	0	35	0	------	0	0	31
Sioux City	0	------	------	1	------	7	0	------	0	0	------
Waterloo	0	------	------	19	------	17	0	------	0	1	------
Missouri:											
Kansas City	1	------	0	223	18	17	0	8	0	2	110
St. Joseph	0	------	2	12	4	2	0	1	0	0	20
St. Louis	7	1	0	56	13	60	4	8	2	4	237
North Dakota:											
Fargo	0	------	0	3	0	0	1	0	0	0	9
Grand Forks	0	------	------	1	------	1	1	------	0	0	------
Minot	0	------	0	0	0	0	3	0	0	0	4
South Dakota:											
Aberdeen	0	------	------	0	------	1	0	------	0	1	------
Sioux Falls	0	------	0	0	0	0	2	0	0	0	10
Nebraska:											
Lincoln	0	------	------	2	------	15	0	------	0	0	------
Omaha	0	------	0	0	8	3	0	1	0	0	53
Kansas:											
Lawrence	0	------	0	0	1	0	0	1	0	0	3
Topeka	0	------	1	8	7	2	1	0	0	19	30
Wichita	0	------	0	1	7	1	0	0	0	0	28
Delaware:											
Wilmington	0	------	0	11	6	4	0	0	0	0	27
Maryland:											
Baltimore	5	17	0	4	24	34	0	10	0	43	217
Cumberland	0	------	0	0	1	0	0	1	0	2	13
Frederick	0	------	0	0	0	1	0	0	2	0	3
District of Columbia:											
Washington	7	1	0	6	18	20	0	1	1	9	176
Virginia:											
Lynchburg	1	------	0	1	3	0	0	1	0	0	12
Norfolk	0	4	0	38	5	4	0	3	0	12	28
Richmond	0	------	0	31	2	1	0	2	0	0	41
Roanoke	2	------	0	2	2	3	0	0	0	4	16
West Virginia:											
Charleston	1	3	1	138	8	0	0	0	1	0	23
Huntington	1	------	------	6	------	0	0	------	0	0	------
Wheeling	0	------	0	25	0	10	0	0	0	4	17
North Carolina:											
Gastonia	0	------	0	0	------	0	0	------	0	2	------
Raleigh	1	------	0	18	7	0	0	0	0	23	19
Wilmington	0	------	0	28	5	0	0	0	0	3	15
Winston-Salem	0	------	0	3	0	1	0	1	0	40	10
South Carolina:											
Charleston	0	16	0	115	1	4	0	0	0	1	23
Florence	0	------	0	1	2	1	0	0	0	0	11
Greenville	0	------	0	2	2	1	0	0	0	13	17
Georgia:											
Atlanta	2	18	1	247	5	4	0	4	0	6	68
Brunswick	0	1	0	0	2	0	0	1	0	0	7
Savannah	1	------	0	23	1	1	0	1	0	0	19
Florida:											
Miami	0	2	1	137	4	2	0	1	0	8	36
Tampa	2	------	0	4	6	2	0	0	0	0	33
Kentucky:											
Ashland	0	------	0	0	2	0	0	1	0	1	17
Covington	0	------	0	0	3	2	1	1	0	0	23
Lexington	1	------	0	3	5	0	0	2	0	0	19
Louisville	2	1	1	328	10	67	0	2	0	6	74
Tennessee:											
Knoxville	2	5	0	18	1	2	0	0	1	0	27
Memphis	0	------	3	323	14	3	0	4	0	4	77
Nashville	0	------	0	91	8	1	0	2	0	18	56
Alabama:											
Birmingham	0	9	1	160	12	3	0	4	0	3	66
Mobile	0	------	1	9	4	0	0	1	0	0	23
Montgomery	0	------	------	14	------	1	0	------	0	3	------
Arkansas:											
Fort Smith	0	------	------	5	------	1	0	------	0	0	------
Little Rock	0	------	2	58	3	2	0	0	0	0	------

City reports for week ended Feb. 19, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	------	0	0	1	0	0	0	0	2	3
New Orleans	5	11	4	2	15	2	0	14	8	18	148
Shreveport	1	------	0	8	12	8	0	1	0	1	38
Oklahoma:											
Muskogee	0	------	------	0	------	0	0	------	0	0	------
Oklahoma City	2	------	1	0	8	5	1	6	0	0	64
Tulsa	2	------	------	0	------	1	2	------	0	3	------
Texas:											
Dallas	0	6	2	2	4	14	0	2	0	0	54
Fort Worth	0	------	3	1	6	9	1	3	0	1	34
Galveston	0	------	0	0	1	1	0	0	0	0	20
Houston	1	------	0	6	7	3	0	9	3	0	95
San Antonio	1	------	3	0	13	1	0	10	0	9	76
Montana:											
Billings	0	------	0	1	1	1	0	0	0	0	7
Great Falls	0	------	0	1	4	0	2	0	0	6	11
Helena	0	1	1	0	0	1	0	0	0	2	4
Missoula	0	------	0	0	3	0	0	0	0	0	16
Idaho:											
Boise	0	------	0	0	2	0	13	0	0	0	13
Colorado:											
Colorado Springs	4	------	0	0	1	3	0	0	0	0	10
Denver	9	------	3	334	9	16	0	5	0	1	97
Pueblo	0	------	0	0	4	2	2	0	0	1	8
New Mexico:											
Albuquerque	0	------	0	11	3	0	0	2	0	0	14
Utah:											
Salt Lake City	0	------	2	87	5	4	1	0	0	3	53
Washington:											
Seattle	0	------	0	0	6	5	0	5	0	47	83
Spokane	0	------	0	0	7	1	0	0	0	5	35
Tacoma	0	------	0	0	0	10	8	0	0	12	26
Oregon:											
Portland	4	5	0	4	10	37	6	1	0	1	79
Salem	0	5	------	1	------	0	0	------	0	0	------
California:											
Los Angeles	9	27	2	13	25	45	1	16	1	4	347
Sacramento	1	1	0	0	4	1	0	1	0	43	32
San Francisco	1	2	0	0	13	11	0	2	0	65	190

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Springfield	1	1	0
New Hampshire:			
Nashua	1	0	0
New York:			
Buffalo	1	1	0
New York City	5	2	0
New Jersey:			
Newark	1	0	0
Pennsylvania:			
Philadelphia	2	1	0
Pittsburgh	2	1	0
Reading	1	1	0
Ohio:			
Cleveland	1	0	0
Columbus	0	1	0
Michigan:			
Detroit	1	1	0
Missouri:			
St. Louis	1	0	0
Kansas:			
Wichita	1	0	0
Maryland:			
Baltimore	1	0	0
Kentucky:			
Louisville	1	0	0
Tennessee:			
Nashville	2	2	0
Alabama:			
Birmingham	4	0	0
Arkansas:			
Little Rock	0	1	0
Louisiana:			
New Orleans	1	0	0
Shreveport	0	1	0
Colorado:			
Pueblo	1	0	0
Washington:			
Seattle	0	1	0
Spokane	1	0	0
California:			
Los Angeles	2	0	0
Sacramento	0	0	1

Encephalitis, epidemic or lethargic.—Cases: Providence, 1; New York, 3; Pittsburgh, 1; Detroit, 2.

Typhus fever.—Cases: New York, 1; Montgomery, 1; Lake Charles, 1.

Pellagra.—Cases: Philadelphia, 1; Atlanta, 2; Brunswick, 1; Savannah, 1; Tampa, 1; Birmingham, 1; Los Angeles, 1.

Rabies in man—Death: New Orleans, 1.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—2 weeks ended January 29, 1938.—During the 2 weeks ended January 29, 1938, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia[1]	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis				1	5					6
Chickenpox	2	6	2	359	701	106	68	28	161	1,433
Diphtheria		9	7	131	10	8	7	9	3	184
Erysipelas		1		12	6	3	1	3	2	28
Influenza		12			161	3			20	196
Measles		5	36	354	574	133	34	186	345	1,667
Mumps		6			297	86	26	18	34	467
Paratyphoid fever					2				1	3
Pneumonia	5	2			56		1		16	80
Poliomyelitis		1		1				2	2	6
Scarlet fever		41	19	242	332	71	77	114	46	942
Smallpox								1	1	2
Trachoma							[2] 69			[2] 69
Tuberculosis	2	29	17	123	88	8	3	4	41	315
Typhoid fever		1	1	78	4	1	3	2	1	91
Undulant fever					3					3
Whooping cough		1	1	411	148	22	14	7	88	692

---

[1] For 2 weeks ended Feb. 2, 1938.

[2] Includes 68 cases among Indians.

CUBA

Habana—Communicable diseases—4 weeks ended February 12, 1938.—During the 4 weeks ended February 12, 1938, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	11	2	Tuberculosis	12	1
Malaria	[1] 11		Typhoid fever	[1] 55	3
Scarlet fever	1				

---

[1] Includes imported cases.

YUGOSLAVIA

Communicable diseases—4 weeks ended January 30, 1938.—During the 4 weeks ended January 30, 1938, certain communicable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	25	3	Paratyphoid fever	15	----------
Cerebrospinal meningitis	32	8	Poliomyelitis	1	----------
Diphtheria and croup	749	72	Scarlet fever	315	5
Dysentery	21	----------	Sepsis	11	3
Encephalitis	3	1	Tetanus	19	5
Erysipelas	206	1	Typhoid fever	551	49
Favus	4	----------	Typhus fever	54	3
Measles	7	1			

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for February 25, 1938, pages 313–327. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

India—Chittagong.—During the week ended February 19, 1938, 1 case of cholera was reported in Chittagong, India.

India (French).—Cholera has been reported in French India as follows: Chandernagor, week ended January 15, 1938, 1 case; Karikal Territory, week ended January 8, 1938, 1 case, 1 death; Pondichery Territory, week ended January 8, 1938, 1 case, week ended January 15, 1938, 1 case.

Indochina (French).—During the week ended February 19, 1938, 72 cases of cholera were reported in Annam Province, and 2 cases in Tonkin Province, French Indochina.

Plague

Bolivia.—During the week ended January 8, 1938, plague was reported in Bolivia as follows: Sucre, 1 case of penumonic plague; Oropeza Province, 2 cases; Tarija, 1 case.

Hawaii Territory—Island of Hawaii—Hamakua District.—One rat found on February 14, 1938, in Hamakua Mill Sector, and one rat found on February 18, 1938, in Paauhau Sector, both in Hamakua District, Island of Hawaii, Hawaii Territory, have been proved positive for plague.

Tunisia—Tunis.—On February 15, 1938, 1 plague-infected rat was reported in Tunis, Tunisia.

Smallpox

China—Hong Kong.—During the week ended February 12, 1938, 156 cases of smallpox with 83 deaths were reported in Hong Kong, China.

Iraq—Baghdad.—During the week ended February 12, 1938, 1 case of smallpox was reported in Baghdad, Iraq.

Venezuela.—According to information dated Feb. 21, 1938, 4,000 cases of smallpox (alsatrim) were reported in Barquisimeto, a city of

50,000 population, in the State of Lara, Venezuela. The disease was stated to be present from Barquisimeto to Valencia and Maracay.

Yellow Fever

Brazil.—Yellow fever has been reported in Brazil as follows: Minas Geraes State—Juiz de Fora, January 29, 1938, 2 deaths; Rio Novo, January 27, 1 death; S. Domingo do Prata, January 19–22, 3 deaths. Rio de Janeiro State—Valença, January 27–29, 1938, 2 deaths.

Senegal—Dakar.—During the week ended February 19, 1938, 1 suspected case of yellow fever was reported in Dakar, Senegal.

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UNITED STATES TREASURY DEPARTMENT

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IN THIS ISSUE

Summary of Current Prevalence of Communicable Diseases
Scarlet Fever Cases and Immunizations in 9,000 Families

28-4-38

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THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg. Gen. ROBERT OLESEN, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PUBLIC HEALTH REPORTS

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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

January 30–February 26, 1938

The accompanying table summarizes the prevalence of eight important communicable diseases based on weekly telegraphic reports from State health departments. The reports from each State are published in the PUBLIC HEALTH REPORTS under the section "Prevalence of Disease." The table gives the number of cases of these diseases for the 4-week period ending February 26, the number reported for the corresponding period in 1937, and the median number for the years 1933–37.

DISEASES ABOVE MEDIAN PREVALENCE

Measles.—The current epidemic of measles, the beginning of which was first noticed about November 1, 1937, is now practically as severe as the outbreaks of 1934 and 1935. The present outbreak started

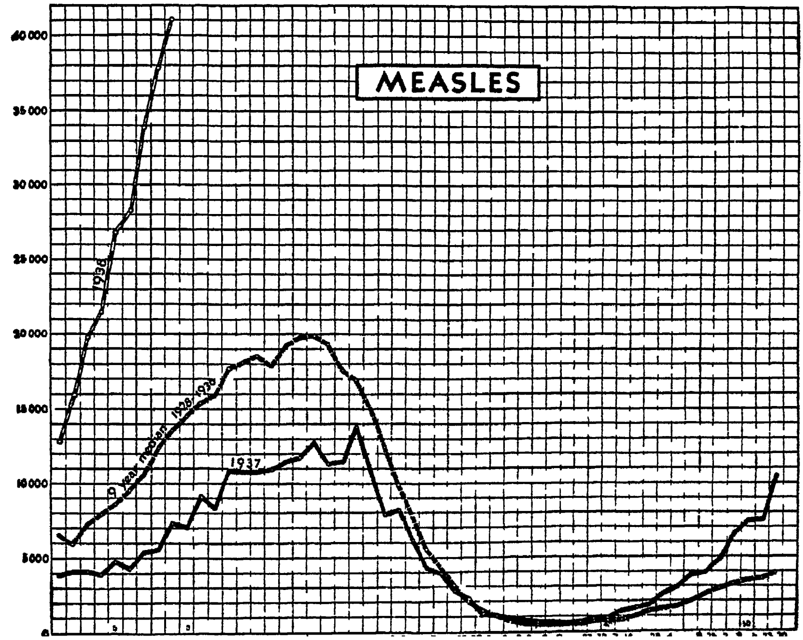

FIGURE 1.—Numbers of reported cases of measles by weeks for 1937 and 1938 and the median number of cases for the 9 years 1928–36

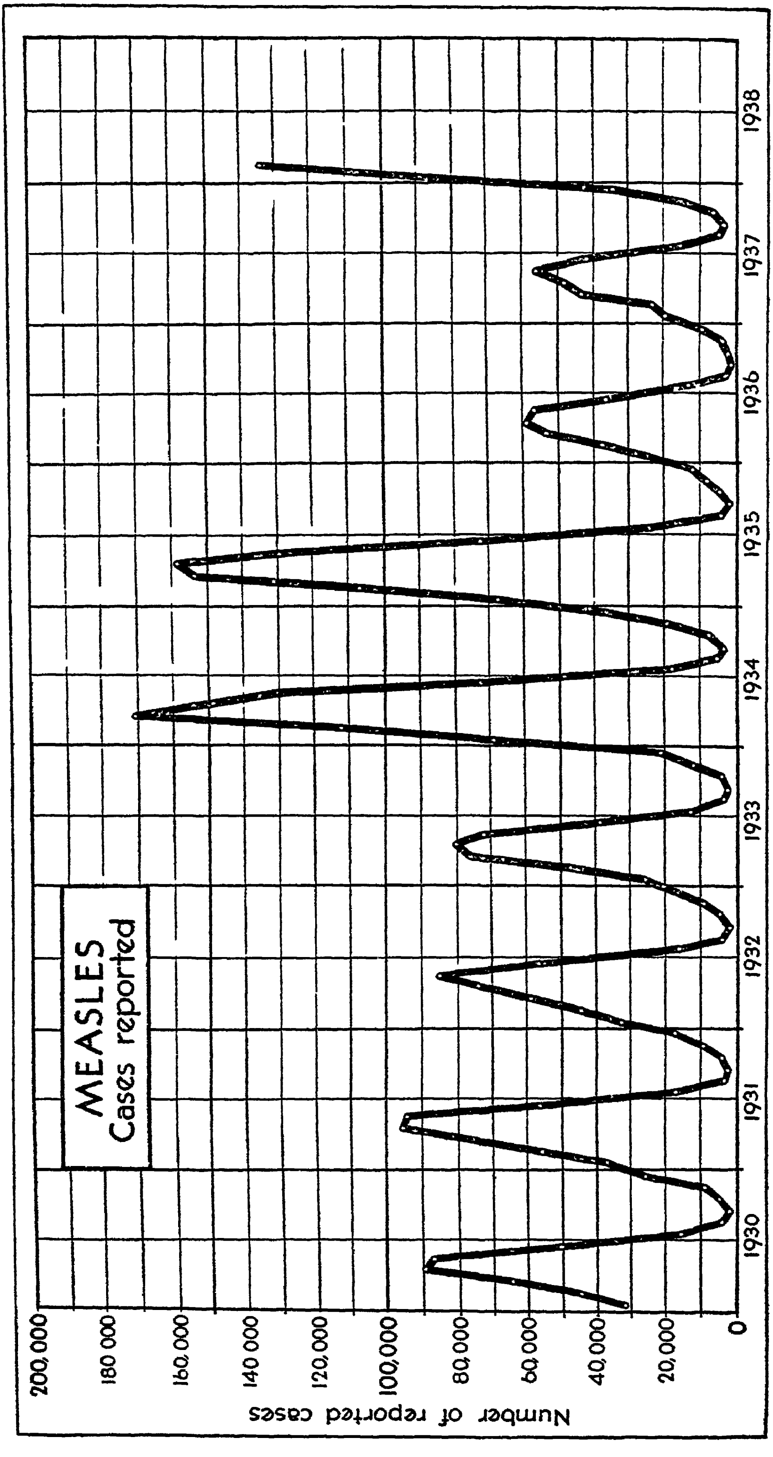

FIGURE 2.—Number of cases of measles reported by months, January 1930–February 1938.

slightly earlier in the fall than did the last two outbreaks, which occurred in 1934 and 1935, and during February was already as severe as the latter were during March and April. The number of reported cases is still increasing, and so it seems likely that the present epidemic will be more severe than the two previous ones. In any case, the current number of cases is several times greater than the median number reported for the period 1928–36 (fig. 1).

The incidence is especially high in the Middle Atlantic, East North Central, and South Atlantic regions; more than 80 percent of the total number of cases was reported from these areas. The East North Central States, Ohio, Indiana, Michigan, Illinois, and Wisconsin, with about 20 percent of the total population, reported 44 percent of the cases of measles for the week ending March 5.

The New England and Pacific Coast States are unusually free from this disease; less than one-half the usual number of cases for this time of year were reported from these areas.

Poliomyelitis.—The number of reported cases of poliomyelitis was about 10 percent above that for the corresponding period in 1937 but nearly 30 percent in excess of the average number reported during the preceding 5 years. A definite increase over the seasonal expectancy was reported from the South Atlantic, East South Central, and Mountain regions, but in other regions the incidence was about normal for this season. The South Atlantic and South Central regions also reported a relatively high incidence at this time in 1937.

Typhoid and paratyphoid fever.—Owing mainly to an unusually large number of cases reported in Louisiana (69) and Texas (62), the incidence of typhoid fever during the current 4-week period was nearly 10 percent greater than the number expected for this time of the year. Except in the West South Central region, however, the number of cases of typhoid fever was about normal.

Smallpox.—The number of cases of smallpox (2,241) reported for the current period was 1.8 times the number reported for this period in 1937 and almost 3 times the average number reported for the years 1933–37. It is the highest incidence of this disease since 1931, when there were approximately 4,100 cases during the corresponding period. The high incidence of smallpox started in the West and has been mostly confined to that territory. Recently, it has spread to all sections of the country except the Atlantic Coast regions.

Number of reported cases of 8 communicable diseases in the United States during the 4-week period Jan. 30–Feb. 26, 1938, the number for the corresponding period in 1937, and the median number of cases for the corresponding period 1933–37 [1]

Division	Current period	1937	5-year median	Current period	1937	5-year median	Current period	1937	5-year median	Current period	1937	5-year median
	Diphtheria			Influenza [2]			Measles [3]			Meningococcus meningitis		
United States [1]	2,436	2,069	2,874	12,990	100,088	28,552	134,607	20,878	42,415	378	678	525
New England	36	43	62	76	4,486	143	2,410	6,319	5,686	12	24	9
Middle Atlantic	414	394	394	131	703	287	42,069	5,818	11,383	60	112	49
East North Central	553	384	531	397	6,121	2,532	51,204	660	7,553	38	98	98
West North Central	196	146	296	836	10,304	1,502	6,372	210	5,931	28	54	54
South Atlantic	397	429	425	2,995	15,524	8,761	17,732	3,600	5,067	79	137	93
East South Central	178	192	225	1,996	8,775	3,630	8,767	614	710	98	94	81
West South Central	400	296	433	5,299	25,132	3,769	2,338	1,646	1,667	38	83	43
Mountain	116	61	71	585	6,227	1,402	2,628	1,442	1,442	9	18	23
Pacific	146	124	191	673	22,816	2,390	1,087	569	2,764	16	58	18
	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
United States [1]	89	80	66	24,290	26,877	26,877	2,241	1,220	754	523	390	481
New England	2	1	1	1,893	1,897	1,585	0	0	1	16	11	14
Middle Atlantic	5	5	7	5,682	6,997	6,708	0	11	0	51	55	57
East North Central	9	11	11	8,245	8,767	9,057	503	196	130	86	44	70
West North Central	4	7	5	3,765	5,180	2,200	661	689	257	36	15	31
South Atlantic	17	18	9	1,034	895	1,004	11	5	4	85	85	85
East South Central	19	23	6	615	614	356	193	9	9	37	64	58
West South Central	9	11	6	844	318	549	268	36	184	153	77	77
Mountain	8	1	2	897	857	857	193	126	72	27	19	17
Pacific	16	3	16	1,315	1,352	1,406	412	148	148	29	20	34

[1] 48 States. Nevada is excluded and the District of Columbia is counted as a State in these reports.
[2] 44 States and New York City.
[3] 46 States. Mississippi and Georgia are not included.

DISEASES BELOW MEDIAN PREVALENCE

Scarlet fever.—The 24,290 cases of scarlet fever reported during the current period are about 10 percent below the seasonal expectancy. In the New England, West North Central, and West South Central regions the incidence was considerably above the median, while the Middle Atlantic and East North Central regions reported a relatively low incidence and other regions reported about the normal seasonal incidence.

Diphtheria.—The incidence of diphtheria (2,436 cases) is slightly in excess of that recorded for the corresponding period in each of the 2 preceding years but it is considerably below the 1933–37 average. The greatest increases over last year were reported from the North Central, West South Central, and Mountain regions; but only the Mountain States reported any definite increase over the expected seasonal incidence.

Meningococcus meningitis.—The incidence of meningococcus meningitis is relatively low. The 378 cases reported for the 4 weeks ending February 26 was less than 60 percent of the number reported for the corresponding period in 1937 and about 70 percent of the 1933–37 average. In the Middle Atlantic and East South Central regions the incidence was somewhat above the normal seasonal expectancy, but in other regions the incidence either closely approximated the average or fell considerably below it.

Influenza.—The number of cases of influenza reported for the current 4-week period (12,990) is unusually low compared with the number reported during 1937, 1936, and 1935, approximately 100,000, 28,000, and 25,000, respectively. The current incidence is approximately equal to that in 1934 (13,041 cases), a year unusually free from influenza. The disease was somewhat above the median level in the West South Central region, but in all other regions the incidence was relatively low.

MORTALITY, ALL CAUSES

The average mortality rate per 1,000 population from all causes in large cities for the 4 weeks ending February 26, based on data received from the Bureau of the Census, was 12.0. The rate was the lowest for the corresponding period in the 13 years for which these data are available, and was no doubt due largely to the low incidence of influenza during the winter months. In 1937 the rate for this period was 14.3 and in 1936 it was 13.8.

History and Frequency of Clinical Scarlet Fever Cases and of Injections for Artificial Immunization Among 9,000 Families, Based on Nation-Wide Periodic Canvasses, 1928–31*

By Selwyn D. Collins, *Principal Statistician, United States Public Health Service*

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The trend of scarlet fever mortality in Massachusetts is available back to 1842 (*15* (1928), p. 99). In the 20 years from 1855 to 1874, death rates from this cause in Massachusetts fluctuated around an average of 86 per 100,000 population, with a peak rate of 173 in 1857 and with rates above 100 for 5 of the 20 years. Aside from waves of high and low rates, which appear in nearly all of the communicable diseases of childhood, there has been a downward trend in scarlet fever mortality since 1875; the rate in 1934 was 1.8 and the average annual rate for the 5-year period, 1930–34, was 2.5 per 100,000.

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*From Statistical Investigations, Division of Public Health Methods, National Institute of Health, U. S. Public Health Service.

This is the tenth of a series of papers on sickness and medical care in this group of families (*1–9*). The survey of these families was organized and conducted by the Committee on the Costs of Medical Care; the tabulation was done under a cooperative arrangement between the Committee and the Public Health Service. Committee publications based on the results deal primarily with costs and Public Health Service publications primarily with the incidence of illness and the extent and kind of medical care, without regard to cost. As costs are meaningless without some knowledge of the extent and nature of the service received, there is inevitably some overlapping. The Committee staff, particularly Dr. I. S. Falk and Miss Margaret Klem, cooperated in the tabulation of the data.

Special thanks are due to Dr. Mary Gover, who assisted in the analysis, to Mrs. Lily Vanzee Welch, who was in immediate charge of tabulating the data, and to other members of the statistical staff of the Public Health Service for advice and assistance in the preparation of the study. I am indebted also to Dr. W. H. Frost, of the Johns Hopkins School of Hygiene and Public Health, for many helpful suggestions.

The trend of scarlet fever mortality in the original registration States[1] roughly parallels that in Massachusetts; the death rate in these States in 1900 was 9.6 per 100,000, with an average for the 5 years 1900–1904 of 11.8. In 1934 the rate in the same States[2] was 2.0, and the average annual rate for the 5-year period 1930–34 was 2.1 per 100,000. The consensus of medical opinion probably is that the virulence of scarlet fever has gradually decreased, with a resulting decline in case fatality (*20, 31*). There is no evidence that the incidence of the disease as represented by the annual case rate has declined in recent years.

A method of immunizing against scarlet fever was described by the Dicks in 1924 (*23, 24*), or about 5 years prior to the first year for which the data were collected for this study. Further developments[3] have taken place (*32, 33*), but the whole immunizing procedure for scarlet fever may be said to be still in the early if not the experimental stages. However, it is of interest to consider the extent to which the process has been used in the general population.

I. SOURCE AND CHARACTER OF DATA

In the study of illness in canvassed white families in 130 localities in 18 States[4] that was made by the Committee on the Costs of Medical Care (*28*) and the United States Public Health Service, all service received from physicians and other practitioners was recorded, whether for illness, immunization, physical examination or other reasons. The records of injections for immunization[5] against scarlet fever for all persons in the observed population afford data on the frequency of this procedure during 12 months covered by periodic canvasses. Information was also obtained on the history of clinical cases and of injections for immunizing against scarlet fever at any time prior to the study.

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[1] The original registration States of 1900 include Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Michigan, Indiana, and the District of Columbia.

[2] The rate for the total continental United States was the same, 2.0 per 100,000 in 1934.

[3] The history of the development and present status of scarlet fever immunization procedures are reviewed in a recent article by Fraser (*29*).

[4] The 18 States sampled and the number of canvassed families were: California (890), Colorado (386), Connecticut (100), District of Columbia (99), Georgia (544), Illinois (463), Indiana (494), Kansas (301), Massachusetts (287), Michigan (329), Minnesota (224), New York (1710), Ohio (1148), Tennessee (212), Virginia (412), Washington (551), West Virginia (318), Wisconsin (290). Further details about the distribution of the canvassed population are included in a preceding paper (*1*).

[5] "Immunization" is used in this paper to mean the injection of the usual number of doses of scarlet fever immunizing material. All cases receiving such service are designated as "immunizations"; no data are available on Dick tests following the injections to indicate whether the process actually changed the skin test or produced immunity in the individual.

The composition and characteristics of the group of 8,758 families which were kept under observation for 12 consecutive months in the years 1928–31 have been considered in some detail in the first report in the series (*1*). These families, including a total of 39,185 individuals, resided in 18 States representing all geographic sections. Every size of community was included, from metropolitan districts to small industrial and agricultural towns and rural unincorporated areas. With respect to income, the distribution was reasonably similar to the estimated distribution of the general population of the United States at the time of the survey.

The method of the study required, among other things, that local visiting nurses from health departments and other agencies make the canvasses of the homes to secure the data. A process of selection obviously entered here, since each locality that was included had a visiting nurse employed by a local health department or some other agency. In such communities a larger percentage of the population may have received the immunizing injections than in those without nursing service and health organizations. On the other hand, since the report for the whole family was made by the housewife or some other adult female, the record of immunizations may be less complete than could be obtained by the questioning of individuals.

II. HISTORY OF CLINICAL CASES AND OF INJECTIONS FOR IMMUNIZATION PRIOR TO THE STUDY YEAR

Table 1 and figure 1 show for specific ages the proportion of individuals who were reported as having received injections for immunizing against scarlet fever, and the proportion who had suffered clinical attacks of the disease at any time in their lives. For adults the record of childhood attacks of a mild disease is probably incomplete because of forgotten cases, particularly for noninformants in the household; the data on the history of scarlet fever include only the ages under 25 years and it is doubtful whether the reports are complete above 15 or 20 years.

The percentage who reported a history of injections for immunization against scarlet fever is small as compared with the history of clinical attacks, but surprisingly large for a procedure that had been available for so few years and that had not been widely advocated by health departments. The more accurate record of the numbers who received the injections during the study year would accumulate to a percentage that is less than half of that reported for the years prior to the study. The newness of the procedure may have resulted in con-

TABLE 1.—*History of scarlet fever immunizations and cases among persons of specific ages of each sex—canvassed white families in 18 States* [1]

Age in years	Both sexes				Percentage of persons with history of—				Total number of persons considered	
	Percentage of persons with history of—			Total number of persons considered	Immunization at any time but no case		Case at any time			
	Immunization or case at any time	Immunization at any time but no case [2]	Case at any time		Male	Female	Male	Female	Male	Female
All ages under 25	10.98	2.67	8.31	20,482	2.58	2.75	7.66	8.94	10,116	10,366
Under 1	0.65	.66	.11	919	.55	.78	--------	.45	915	893
1	1.12		.34	889						
2	3.54	2.02	1.25	1,044	2.38	1.65	2.01	1.93	1,093	1,034
3	4.43		2.68	1,083						
4	6.18	2.26	3.97	1,133	2.19	2.32	4.75	4.04	1,138	1,163
5	7.11		4.79	1,168						
6	8.55	3.09	5.79	1,158	3.12	3.06	6.42	7.34	1,184	1,144
7	11.37		7.95	1,170						
8	11.22	3.67	7.72	1,204	3.36	3.97	8.84	8.55	1,075	1,184
9	13.73		9.85	1,005						
10–11	15.78	4.05	11.73	1,978	3.45	4.02	10.92	13.59	2,298	2,207
12–14	16.13	3.49	12.64	2,587						
15–19	15.94	2.97	12.97	3,037	3.09	2.81	11.95	14.00	1,523	1,514
20–24	13.10	1.23	11.87	2,107	.68	1.64	10.67	12.74	890	1,217

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[1] Dates of interviews varied from 1928 to 1931. Data refer to histories at the beginning of the 12-month morbidity study.

[2] Immunization history rates for older age groups were as follows: 25–44 years, 1.42 percent; 45 years and over, 0.59 percent.

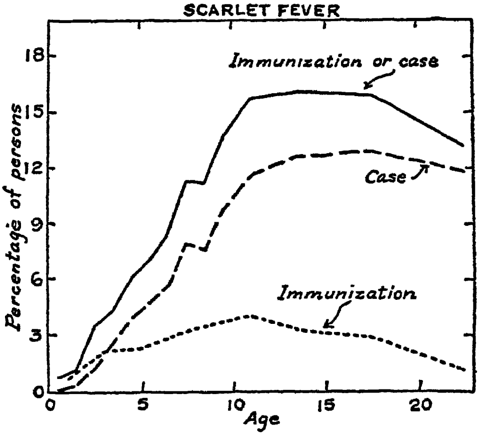

FIGURE 1.—Percentage of persons of specific ages (a) who had received injections for immunization and (b) who had suffered an attack of scarlet fever—8,758 canvassed white families in 18 States, 1928–31.

fusion with Dick tests, and thus led to an overreporting of histories of injections in preceding years.

As reported by the families, 0.7 percent of children under 2 years of age had received the injections prior to the study; the curve rises as age increases to a maximum of 4.1 percent at 10–11 years with a decline thereafter to 1.2 percent at 20–24 years.[6] This curve represents the reported history of injections for artificial immunization at any time in the past and therefore is cumulative in nature. Two circumstances account for the decrease in the adult ages: (*a*) injections for artificial immunization against scarlet fever have come into use only recently, and (*b*) adults are seldom given the injections as the great majority have become immune by natural processes.

The percentage of children with a history of a clinically recognized and remembered attack of scarlet fever was large as compared with the percentage artificially immunized; therefore the curve (fig. 1) for the total with a history of a clinical case or injections for immunization is similar to that for cases of scarlet fever.

None of these curves represents the total percentage with immunity to scarlet fever because Dick tests indicate that a large proportion of persons, particularly older children and adults, are relatively immune to scarlet fever without a history of a clinically recognized case or injections to immunize artificially. No data on Dick tests are available on the group considered in this study.

Table 1 shows for each sex separately data of the kind considered above for both sexes. No significant differences between the sexes appear.

The numbers of persons who reported that they had received the injections for immunization against scarlet fever are too few to indicate much about their distribution with respect to geographic section or size of city. The available data show no significant differences between urban and rural places included in the study. Regarding geographic region, the indications are that the immunizing procedure has been used less in the South than elsewhere; the North Central region reported slightly more injections than the other sections.[7]

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[6] Of the persons 25–44 years of age, 1.4 percent reported that they had received injections for immunizing against scarlet fever; this figure is about one-third of the maximum of 4.1 percent for 10- and 11-year-old children. In the case of diphtheria, 3 2 percent of 25- to 44-year-old persons had been immunized against the disease, but this is only one-thirteenth of the maximum of 43.1 percent for 9-year-old children. The procedure for immunizing against scarlet fever appears to be used relatively more in the adult ages than the older diphtheria immunization procedure.

[7] Comparison of the percentages of children of specific ages who reported a history of a clinical attack of scarlet fever prior to the study indicates no definite variation in different geographic areas except (*a*) lower percentages for the ages 15–24 in the South and thus, relative to these ages, a higher percentage for the ages under 5 years, and (*b*) in the North Central region the percentages of children with a history of attack were slightly higher than in the other regions, particularly for the ages 5–14 years.

During the 12-month period of the study scarlet fever in the canvassed families was also low in the South and highest in the North Central section. The case rates per 1,000 children under 15 years of age were: South, 8.8 (30 cases); Northeast, 11.7 (42 cases); West, 13 6 (36 cases); and North Central, 16.2 (100 cases).

Mortality in the general population for the 6 years 1927–32 was somewhat higher in the North Central than in other regions; the higher rate existed in rural, urban, and metropolitan areas considered separately. The rate for white persons in the South was not quite as low as the rate for the West.

Considering death rates for individual States for the same period, 6 of the 12 States in the North Central section and 5 States in the northern part of the Rocky Mountain region (from Colorado north) had rates above 25 per million. Of the rates for white persons in the 16 States of the South (District of Columbia included but Texas excluded) the only State with a rate above 25 per million was in the northern tier of the

III. CLINICAL CASES AND INJECTIONS FOR IMMUNIZATION DURING THE 12-MONTH STUDY

INJECTIONS FOR IMMUNIZING AGAINST SCARLET FEVER

In the observed group, which included 38,544 person-years of life, 28 series of injections were reported, or a rate of 0.73 per 1,000, for the year. Of the total, 26 were done on persons under 15 years of age and amounted to a rate of 1.65 per 1,000 population of these ages. The rates in the three 5-year age groups were similar, 1.63 for under 5 years, 1.75 at 5–9, and 1.53 per 1,000 at 10–14 years. The rate for girls under 15 years was 1.91, slightly higher than for boys, which was 1.39 per 1,000.

Only 36 percent of the 28 series of injections were done in public clinics, as compared with 57 percent of diphtheria immunizations, 52 percent of typhoid immunizations, and 42 percent of smallpox vaccinations. Among families with annual incomes of less than $3,000, the rate of injections for immunization against scarlet fever was 1.1 per 1,000 children under 15 years, as compared with 2.9 among families with incomes of $3,000 or above, and 5.0 per 1,000 for those families in the latter group with incomes of $5,000 or above. While the numbers are small, these data suggest that scarlet fever injections for immunization are largely confined to the higher income brackets.

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group (Kentucky); and of the Northeastern States only 2 (Massachusetts and New Hampshire) had rates as high as 25 per million. The following table shows rates by sections:

Geographic section	Average annual death rate per million, 1927–32				
	Total	All urban (10,000 or over)	Rural (under 10,000 and rural areas)	Cities 10,000 to 100,000	Cities of 100,000 or over
All sections	21.0	22.5	19.6	21.4	23.1
Northeast	20.7	20.6	21.0	19.5	21.2
North Central	28.0	29.9	26.2	26.8	31.6
West	17.0	13.4	20.1	18.6	11.0
South	14.3	17.0	13.5	17.1	17.0
White	18.3	21.1	17.4	22.5	19.9
Colored	3.6	5.6	2.9	3.1	7.9

The four sections used are combinations of the nine United States census regions as follows: Northeast=New England and Middle Atlantic; North Central=East and West North Central; South=South Atlantic and East and West South Central; West=Mountain and Pacific.

For the years prior to 1930 the urban (10,000 or over in population) classification is made on the basis of the 1920 census; for the years 1930 and later the classification is made on the basis of the 1930 census. The cities of 100,000 and over include for all years all cities that were 100,000 or over in 1930.

Considering urban and rural differences, the relationship varies in different sections; in two regions the urban rates are higher, in one the rural rate is higher, and in one there is little difference between urban and rural. The error due to nonresident deaths is probably negligible.

No significant differences appear between urban and rural areas in the history of clinical cases prior to the study as obtained by the family canvasses. For the 12-month period of the study the scarlet fever case rate per 1,000 children under 15 years of age was 9.2 (56 cases) in rural areas and towns under 5,000, as compared with 15.7 (152 cases) in places of 5,000 or more population (mostly large cities).

Neither histories of cases nor records of immunizing injections prior to the study were particularly different in households that were attacked from those that were not attacked by the disease during the study year. Of 452 children under 15 years of age in attacked households, 9, or 2.0 percent, had been previously immunized, and 20 children, or 4.4 percent, had been previously attacked. These figures may be compared with 2.8 percent immunized and 6.9 percent previously attacked for children under 15 years of age in all canvassed households.

The presence of a case in the family during the study year seems to have stimulated injections for immunizing other children in the household. Of the 244 children under 15 years of age in attacked households who were themselves not attacked during the study year, 4 children, or 1.6 percent, were immunized during the year, as compared with 0.16 percent among children of these ages in the whole surveyed group.

SCARLET FEVER CASES IN THE OBSERVED POPULATION

Incidence in the total surveyed population.—Of the 230 cases [8] of scarlet fever in the surveyed population, 218 had their onset within the study year and 12 cases began just prior to but were sick during the year. The 218 new cases give an annual rate of 566 per 100,000, but adjustment to the age distribution of the general population brings it down to 420. This rate may be compared with an average annual rate of 173 per 100,000 in 1929–30 as based on cases reported to health departments in the 18 States sampled in the survey. Thus the reported rate was only 41 percent of the rate found by the canvass. The discrepancy is so large that it suggests that the rate in the canvassed group was exceptionally high, presumably because of epidemics in an unusually large number of the surveyed localities. The difference is probably not all due to incompleteness of reporting; various check-ups suggest that roughly two-thirds of recognized scarlet fever cases are reported to health departments.[9]

Of the total of 230 cases of scarlet fever in the surveyed group, 208 occurred in children under 15 years of age. Of these cases, 203, or 14.2 per 1,000, occurred among 14,298 children (years of life) who had never been immunized or attacked; 3, or 2.8 per 1,000, occurred among

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[8] Of the 230 scarlet fever cases, 218, or 95 percent, were attended by a physician; 26 of these cases, or 11 percent of all cases, were hospitalized. Two of the other cases had a nurse, but 10 had no professional attendant.

Of the 218 cases attended by a doctor either in or outside a hospital, 168, or 77 percent, of the diagnoses were confirmed by the doctor as correct; in the other 50 attended cases the doctor's diagnosis was not available. Of the 10 unattended cases, 6 were seen by a local health officer and presumably may be considered as confirmed diagnoses. Other surveys have indicated that in the acute communicable diseases the informant's report is nearly always confirmed by the doctor as the correct diagnosis.

[9] A canvass by the State health authorities of over 27,000 families, including nearly 120,000 individuals, in various counties in Illinois and a checkup with the files of reported cases (*14*, p. 28) indicated that 62 percent of 937 scarlet fever cases that occurred in that group during 1929 were reported to the health department. A similar canvass and checkup on 11,377 households including 58,834 persons in 68 southeastern counties having full-time health officers showed that 72 percent of 437 cases of scarlet fever that occurred had been reported to the health authorities (*22*).

1,054 children who were reported as having been previously attacked; and 2, or 4.7 per 1,000, among 425 children under 15 years who reported a history of injections for scarlet fever immunization.[10] The number of children in the latter group is too small to have any statistical significance.

Rates based on attacked households.—Of the 8,758 surveyed households, 171 were attacked by scarlet fever during the study year; 134 households had 1 case, 24 had 2 cases, 8 had 3 cases, and 5 households had 4 or more cases.

Of the 230 cases of scarlet fever, 186 were primary or first cases in the household and 44 were secondary cases, that is, attacks among those who were exposed to a case in the household.[11] When the 186 primary cases are deducted from the 862 persons in attacked households, there are 676 persons exposed to these cases and 44 of them, or 6.5 percent, were attacked. (See table 2.)

TABLE 2.—*Scarlet fever attack rates among persons exposed to a case in the household and the annual incidence in the whole observed population—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Age in years	All persons observed						Persons with no history of a prior case					
	Annual case rate per 100	Persons in attacked households [1]					Annual case rate per 100	Persons in attacked households [1]				
		Total persons	Primary [2] cases	Total persons minus primary cases	Secondary [2] cases	Secondary attack rate per 100		Total persons	Primary [2] cases	Total persons minus primary cases	Secondary [2] cases	Secondary attack rate per 100
All ages [3]	0.60	[3] 862	186	[3] 676	44	6.5	0.65	[3] 805	184	[3] 621	43	6.9
All ages under 15	1.32	452	171	281	37	13.2	1.39	431	169	262	36	13.7
Under 2	.62	56	12	44	2	4.5	.62	56	12	44	2	4.5
2-3	.76	47	13	34	3	8.8	.77	47	13	34	3	8 8
4-5	1.77	68	32	36	9	25.0	1.82	66	31	35	9	25.7
6-7	2.40	91	49	42	7	16.7	2.58	89	49	40	7	17.5
8-9	1.36	59	23	36	7	19.4	1.49	57	23	34	7	20.6
Under 5	.96	137	43	94	10	10.6	.98	136	43	93	10	10.8
5-9	1.82	184	86	98	18	18.4	1.94	179	85	94	18	19.1
10-14	1.12	131	42	89	9	10.1	1.22	116	41	75	8	10.7
15-34	.15	193	13	180	3	1.7	.17	168	13	155	3	1.9
35 and over	.05	215	2	213	4	1.9	.06	205	2	203	4	2.0

[1] Includes births during study year if born before case occurred in household.

[2] Two cases in a household with onset on the same day are both counted primary; secondary includes all with a date of onset subsequent to the first case. According to these definitions, 10 of the 24 households that had 2 cases reported both as primary (onset on same date), and 1 of the 5 households that had 4 or more cases reported all of its 6 cases as primary (onset on same date). The other 26 households with 2 or more cases reported only 1 primary. The ages of the pairs of primary cases in the 10 households were 2, 6; 4, 6; 5, 6; 7, 8; 7, 9; 7, 9; 7, 13; 9, 14; 10, 12; 13, 50; and the ages of the 6 primary cases in one household were 3, 4, 6, 8, 9, 11. None of the above cases had a history of a prior attack or of injections for immunization.

Of the 10 households with 2 primary cases, 3 had 1 other secondary case, 1 had 2 other secondary cases, and 1 had 3 other secondary cases.

Of the 171 attacked households, 134 had 1 case, 24 had 2 cases, 8 had 3 cases, and 5 had 4 or more cases.

[3] "All ages" includes a few of unknown age.

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[10] Adjustment for age does not materially change these rates.

[11] See note to table 2 for further details about the classification of cases as primary and secondary in this study.

Considering in a similar way those persons under 15 years of age who were exposed to a case in the household, 13.2 percent were attacked. When the group is limited to children without a prior attack, 13.7 percent of those exposed were attacked. Of the children under 15 who were without prior attack or prior injections for immunization, 14.1 percent of those exposed to a case in the household were attacked. A further restriction of the exposed population to those with a positive Dick test would presumably increase still more the secondary attack rate but no data on skin tests are available for the groups surveyed in this study.

Secondary attack rates are shown in table 2 for persons of specific ages. The highest rates occur from 4 to 10 years, with the maximum at 4–5 years, in agreement with the findings of Pope (*31*) for Providence (1904–23), and Green (*30*) for Cleveland (1925–28). The rates are somewhat less than in the Providence data but about the same as in Cleveland.[12]

While the secondary attack rates shown in table 2 do not seem high, they are approximately ten times the annual case rates in the whole canvassed population as shown in the same table; in other words, the risk of attack among children in the same household with a case is at least ten times the annual risk of attack among children of similar ages in the general population.[13]

AGE AND SEX INCIDENCE AS REPORTED TO HEALTH DEPARTMENTS

The age and sex incidence of scarlet fever in the surveyed population is shown in table 3. The 230 cases give a general picture of the age incidence of the disease, but one must turn to State Health Department reports for more extensive data. Table 4 and figure 2 show the age incidence of scarlet fever (single years to 10) in Alabama, Connecticut, and New York State (exclusive of New York City, Buffalo, and Rochester). The reported rates are about the same in the two northern States but are smaller in Alabama; the rates are

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[12] There are some variations in tabulating and computing procedures in the different studies. When two or more cases in a family had the same date of onset, and there were no earlier cases, the Providence reports use only one as a primary case and the others as secondary. This procedure appears to have been used in Cleveland also. If the data of the present study are tabulated on the basis of counting only one primary case for an attacked household, the secondary attack rate for children under 15 years of age with no prior attack is 18.1 per 100, which is about the same as in Providence but larger than in Cleveland (As all except one of the cases involved were under 15 years of age, it makes little difference which is selected as "primary" and which is considered as "secondary," so long as one works only with the total under 15 years). Pope (*31*) states that the secondary attack rate varies widely from year to year in Providence; therefore, close agreement would not necessarily be expected.

The Providence data are based on families in which the patient remained at home throughout the illness and did not die; adjustment of the data of the present study to that basis makes no consistent differences in the secondary attack rates.

[13] Since the period of exposure to cases in a given household would not average more than 2 months, the secondary attack rate might be multiplied by six to put it on an annual basis comparable to the annual incidence rate in the whole population. Thus the risk of attack during exposure to a case in a household might be as much as 60 times the risk in the general population.

TABLE 3.—*Annual incidence of scarlet fever among males and females of specific ages—canvassed white families in 18 States during 12 consecutive months, 1928–31*

Age in years	Annual case rate per 1,000			Number of cases			Population (years of life)		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes	Male	Female
All ages [1]	6.0	6.5	5.5	230	122	108	[1] 38,544	[1] 18,896	[1] 19,627
All ages under 15	13.2	14.5	11.9	208	115	93	15,796	7,920	7,846
Under 2	6.2	7.1	5.5	14	8	6	2,251	1,133	1,097
2–3	7.6	8.2	6.8	16	9	7	2,116	1,093	1,023
4–5	17.7	19.3	16.1	41	22	19	2,318	1,140	1,178
6–7	21.0	22.0	26.2	56	26	30	2,329	1,184	1,145
8–9	13.6	15.8	11.4	30	17	13	2,214	1,078	1,136
Under 5	9.6	11.4	7.8	53	32	21	5,513	2,808	2,684
5–9	18.2	17.7	18.7	104	50	54	5,715	2,820	2,895
10–14	11.2	14.3	7.9	51	33	18	4,568	2,301	2,267
15–19	2.3	2.6	2.0	7	4	3	3,050	1,527	1,523
20–34	1.2	.3	1.8	9	1	8	7,759	3,296	4,463
35–49	.5	.3	.7	4	2	4	7,858	6,065	5,687
50 and over	.5			2			3,894		

[1] "All ages" includes a few of unknown age; "both sexes" includes a few of unknown sex.

TABLE 4.—*Age incidence of scarlet fever in Alabama, New York,[1] and Connecticut—based on cases reported to health departments,[2] 1927–32*

Age in years	Annual case rate per 100,000					Number of cases reported in the 6 years				
	Alabama (white)			Both sexes		Alabama (white)			Both sexes	
	Both sexes	Male	Female	New York	Connecticut	Both sexes	Male	Female	New York [1]	Connecticut
All ages [3]	76.4	61.9	91.2	205.6	173.3	[3] 7,797	[3] 3,184	[3] 4,613	58,672	[3] 16,711
All ages under 15	193.4	156.2	232.0	633.8	507.7	7,129	2,929	4,200	46,911	13,570
Under 1	58.8	61.4	56.2	76.9	50.5	143	76	67	331	75
1	119.5	112.3	126.9	187.3	54.2	283	136	147	818	82
2	215.0	209.5	220.8	431.7	370.0	538	267	271	2,033	603
3	259.5	214.9	305.4	635.8	563.3	674	283	391	3,057	939
4	347.3	299.5	396.8	776.2	648.5	854	375	479	3,714	1,089
5	286.3	225.5	348.9	950.9	805.6	739	295	444	4,810	1,434
6	358.7	282.6	437.7	1,136.5	980.0	925	371	554	5,722	1,757
7	321.2	253.0	391.7	1,033.2	876.3	799	320	479	5,270	1,573
8	242.5	174.0	313.2	877.1	757.4	644	235	409	4,645	1,446
9	173.4	123.4	225.2	767.2	584.5	439	159	280	4,016	1,102
Under 5	201.7	180.7	223.4	433.3	349.6	2,492	1,137	1,355	9,953	2,788
5–9	276.3	211.5	343.2	951.0	799.0	3,546	1,380	2,166	24,463	7,312
10–14	93.5	69.4	118.5	493.5	361.3	1,091	412	679	12,495	3,470
15–19	22.4	18.2	26.5	181.7	119.6	248	101	147	4,297	1,063
20–24	11.2	5.7	16.3	107.3	71.4	109	27	82	2,406	565
25–34	6.5	3.4	9.5	71.2	42.3	94	24	70	3,027	614
35–44	2.4	2.1	2.6	34.4	[4] 17.4	27	12	15	1,469	[4] 357
45–54	.9	.8	.9	12.5	[5] 4.0	8	4	4	426	[5] 71
55 and over	.3	.4	.2	8.0		3	2	1	136	

[1] Exclusive of New York City, Buffalo and Rochester, and exclusive of cases and deaths in State institutions.

[2] Data from annual reports of the respective State health departments (*11, 15, 18*).

[3] "All ages" includes some of unknown age.

[4] 35–49.

[5] 50 and over.

plotted on scales that afford an accurate comparison of the relative age curves. In New York and Connecticut there is a single peak at 6 years of age, but the Alabama curve has two peaks of almost equal size, at 4 and 6 years, respectively. The rates for Mississippi (table 5) are, like those for Alabama, relatively high for the ages under 5 years, but the rates for California and Michigan are more like those for New York.

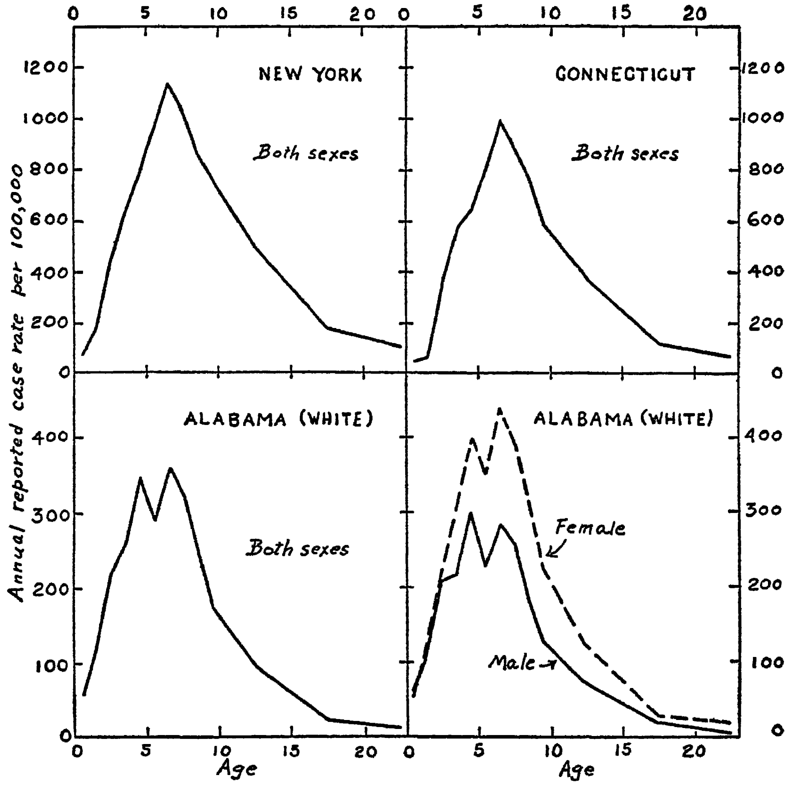

FIGURE 2.—Age and sex incidence (in single years to 10) of scarlet fever as reported to health departments in Alabama, Connecticut, and New York (exclusive of New York City, Buffalo, and Rochester), 1927-32. (Scales are so made that the rate for all ages under 15 years represents an interval on the vertical scale that corresponds to approximately 10 years on the horizontal scale.)

In Alabama and Mississippi during the 6 years 1927–32 the case rates under 5 years are 73 and 67 percent, respectively, of the rates at 5–9 years, but the corresponding percentages in the northern States are New York 45, Connecticut 44, Michigan 52, and California 40 percent. Thus among white persons in the two southern States the rates under 5 years are relatively higher than in the North.

Along with this relatively high rate for children under 5 years in the South goes a relatively low rate among older children. In Alabama and Mississippi the case rate under 5 years is 9.0 and 6.6 times, respectively, that at 15–19 years, as compared with 2.4 for New York, 2.9 for Connecticut, 3.3 for Michigan, and 2.5 for California. Corresponding ratios for death rates under 5 years to those at 15–19 years are 47.7 and 18.5 for Alabama and Mississippi, respectively, as compared with 5.0 for New York, 11.2 for Connecticut, 8.1 for Michigan, and 5.3 for California.[14]

Thus in the South there is a greater concentration of cases in the preschool ages, with relatively lower rates in the ages of adolescence, than in the North. These same differences between South and North show up in diphtheria and apparently to a more marked degree. In Alabama and Mississippi the diphtheria case rate is considerably higher for the ages under 5 than for 5–9 years; but in New York, Connecticut, Michigan, and California the reverse is true (*9*).

TABLE 5.—*Age incidence of scarlet fever in Michigan, California, and Mississippi—based on cases reported to health departments,*[1] *1927–32*

Age in years	Annual case rate per 100,000					Number of cases reported in the 6 years				
	Michigan			Both sexes		Michigan			Both sexes	
	Both sexes	Male	Female	California	Mississippi (white)	Both sexes	Male	Female	California	Mississippi (white)[3]
All ages [2]	258.8	241.2	277.9	147.7	90.9	[2] 75,194	[2] 36,462	[2] 38,732	[2] 50,325	5,434
All ages under 15	715.2	702.1	728.7	524.9	236.9	60,331	30,028	30,303	40,785	4,960
Under 5	570.7	585.2	555.7	321.8	233.3	15,870	8,289	7,581	7,827	1,630
5–9	1,088.8	1,050.7	1,128.0	798.2	350.5	31,813	13,561	16,252	22,289	2,560
10–14	462.8	447.9	478.0	419.3	115.4	12,648	6,178	6,470	10,669	770
15–19	173.4	164.3	182.6	128.4	35.1	4,338	2,062	2,276	3,303	226
20–24	131.8	105.6	158.8	59.9	24.3	3,306	1,345	1,961	1,707	138
25–34	88.8	68.9	110.8	39.8	10.2	4,302	1,756	2,546	2,338	86
35–44	32.8	25.0	42.1	15.7	2.6	1,436	596	840	879	18
45–54	11.6	8.9	14.8	4.5	1.1	347	144	203	195	6
55 and over	2.6	2.5	2.7	1.4	--------	87	43	44	69	0

[1] Data from annual reports of the respective State health departments (*12, 16, 17*).

[2] "All ages" includes some of unknown age.

[3] In the Mississippi State Health Department reports the cases for 1927–28 are given by color for all ages only; to take the colored cases out of the totals for each age group, they were assumed to have the same age distribution as the colored cases for 1929–32.

The age groups used in the 1927–28 report were broader than in the 1929–32 reports; to combine the 1927–28 and 1929–32 cases it was assumed that the cases 10–19 years of age in 1927–28 were distributed between 10–14 and 15–19 as in 1929–32; it was also assumed that the age distribution of cases for the ages 20 years and over was the same in 1927–28 as in 1929–32.

The differences between the age distribution of scarlet fever in the South and North may be illustrated in another way. In Alabama and Mississippi, 33 and 30 percent, respectively, of the reported cases in 1927–32 were in children under 5 years of age, but in New York (exclusive of New York City, Buffalo, and Rochester) and also Connecticut, only 17 percent of the cases were in that age group. In Michigan 21 percent and in California 16 percent of the cases were in children under 5 years. Turning to mortality for the same period, 66 and 55 percent of the scarlet fever deaths in Alabama and Mississippi, respectively, were under 5 years of age, as compared with 31 percent in New York, 35 percent in Connecticut, 44 percent in Michigan, and 29 percent in California. While there are more young children in the South, the differences in the age distribution of scarlet fever are greater than would be accounted for by the age distribution of the population. Doull (*26*) has discussed differences in the age incidence of scarlet fever in relation to latitude.[15]

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[14] If ratios of the case and death rates at 5–9 to those at 15–19 years are computed in a similar way, the two southern States also stand out as having, relative to the rate at 5–9 years, a lower case and a lower death rate at 15–19 years than in any of the four northern States.

Figure 2 shows also scarlet fever age incidence (single years to 10) by sex for Alabama. The concentration of cases in the early ages is somewhat greater for males than females. In males the peak at 4 years is slightly higher than that at 6, but in females the 6-year peak is more important. The reported rates for females are definitely and consistently higher than for males at all ages except those under 3 years (table 4).

Data for Michigan are available by sex in 5-year age groups (table 5); the rates for females are higher than for males at all ages except under 5 years. The percentage excess is particularly large in the adult ages, presumably because of the close contact between the mother and her children when they have the disease.

MORTALITY AND CASE FATALITY

In the continental United States 356,855 cases (white and colored) of scarlet fever were reported in the 2 years 1929–30, an average annual incidence of 145 per 100,000. A total of 4,858 deaths registered [16] gives an annual mortality rate of 1.98 per 100,000 and a case fatality of 1.36 percent, a figure that is no doubt too high because of the incompleteness of case reporting. To express it in another way, there were 73 cases reported for each death registered. In a group of 81 cities (*19*) with populations over 100,000, where reporting is probably better but still incomplete, the average annual case rate for

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[15] The 1925 report for New York (*18*) gives for the years 1915–24 scarlet fever cases and deaths by age and size of city, with cities under 2,500 and rural as one of the categories; 16.1 percent of the reported cases in these rural areas were under 5 years of age as compared with 18.7 for places from 20,000 to 200,000, the most urban group shown. Scarlet fever deaths showed more variation; in communities of less than 2,500 and rural areas, 34 percent of the deaths were of children under 5 years of age, as compared with 39 percent in cities of 20,000 to 200,000 population. These percentages for the years 1915–24 are higher than those for 1927–32 that are cited above.

The geographic differences in the age distribution of scarlet fever are considerably greater than the urban-rural differences in these data for New York State.

For the 12-month period of the study, scarlet fever case rates among the canvassed families were computed in 5-year age groups for (*a*) towns under 5,000 and rural areas, and (*b*) towns and cities over 5,000, consisting mainly of large cities. In the rural group the rate under 5 years was only about half of that at 10–14 years; in the cities the rate under 5 was about the same as at 10–14 years. The numbers of cases were small but the tendencies are the same as in the New York State data and as found by Fales (*27*) in a study of data from various States; that is, there is a relatively younger age distribution of cases in urban than in rural areas.

[16] Mortality Statistics (*10*) supplemented by State reports (*19*) for South Dakota in 1929 and Texas in 1929 and 1930.

1929–30 was 181 per 100,000, and the death rate 2.06 per 100,000, with a case fatality of 1.14 percent, or 88 cases reported for each death registered. Wood (*34*), in studies in Pennsylvania (1930–31), found a case fatality of 0.85 percent, or 117 cases for each death occurring in the families investigated. In the 6 years 1927–32 the case fatality as based on reported cases in California and Connecticut was 0.80 and 0.68 percent, respectively. The wide differences between the various States are largely artificial, resulting from the incompleteness with which the cases are reported. The true fatality of scarlet fever about 1930 was probably somewhat less than 1 death per 100 cases.[17]

Table 6 and figure 3 show scarlet fever mortality by age and sex in the white population of the registration States. The peak of mortality comes at 3 years of age, which is 1 to 3 years earlier than the maximum case incidence. After the peak, the decline is rapid, but there is a considerable number of deaths among adults; 21 percent of the scarlet fever deaths were in persons aged 15 years or over, as compared with 8 percent of diphtheria deaths for the same area and period.

TABLE 6.—*Annual scarlet fever mortality at specific ages for each sex—white persons in the registration States,[1] 1929–30*

Age in years	Annual death rate per million			Number of deaths (2 years)		
	Both sexes	Male	Female	Both sexes	Male	Female
All ages [2]	21.9	21.7	22.1	[2] 4,570	[2] 2,293	[2] 2,277
All ages under 15	60.1	62.4	57.7	3,604	1,899	1,705
Under 1	60.0	66.3	53.6	217	122	95
1	114.5	125.4	103.1	412	230	182
2	118.3	126.1	110.3	456	247	209
3	123.8	130.8	116.7	489	262	227
4	103.1	107.7	98.3	404	215	189
Under 5	101.5	111.7	97.0	1,978	1,076	902
5–9	58.8	60.1	57.5	1,229	637	592
10–14	19.7	18.2	21.2	397	186	211
15–19	12.2	11.0	13.4	235	106	129
20–24	11.1	8.0	14.1	200	71	129
25–34	9.0	7.6	10.5	288	120	168
35–44	4.5	3.7	5.4	133	56	77
45–54	2.9	2.1	3.7	65	25	40
55–64	2.0	1.3	2.8	30	10	20
65 and over	1.1	.8	1.3	13	5	8

[1] Registration States included all except Texas and South Dakota in 1929 and all except Texas in 1930.
[2] "All ages" includes a few of unknown age.

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[17] Among the 230 scarlet fever cases in the canvassed population of the present study there were 6 deaths, or a case fatality of 2.6 percent. The 6 deaths were distributed as follows: Two deaths among 17 cases in Illinois (Chicago); 3 deaths among 26 cases in Wisconsin; and 1 death among 10 cases in Washington State. If the data from the present study are combined with preceding surveys of a similar nature, there is a total of 7 deaths among 432 cases, or a case fatality of 1.6 percent. (The various surveys include: Hagerstown, Md., 1921–24, 34 cases, no deaths; Syracuse, N. Y., 1930–31, 46 cases, no deaths; Cattaraugus County, N. Y., 1929–32, 84 cases, 1 death; families canvassed for less than a full year in the present study, 38 cases, no deaths; families canvassed for the full year in the present study, 230 cases, 6 deaths.)

Among children under 10 years, scarlet fever mortality rates are somewhat higher for males than females but above that age the reverse is true.

Tables 7 and 8 show case fatality for persons of specific ages in six States. The variation from State to State is largely artificial, since it results mainly from the incompleteness of reporting of cases. The purpose of the table is to show the relative case fatality at different ages rather than to compare States. In figure 4 these rates are plotted (single years to five) for Alabama and New York State. Unlike the other children's diseases, the percentage of cases that end fatally is not much higher among infants under 1 year of age than among 1-year-old children. In Alabama there is no difference between the two ages. Studies of scarlet fever in Providence (*31*) and elsewhere (*25*) confirm this finding. After 1 year the fatality drops precipitously (fig. 4) to a low level for the ages above 3 or 4 years, but there is apparently some increase in the middle and older ages of life (tables 7 and 8). Relative to the fatality of cases over 5 years of age, that of children under 5 tends to be slightly greater in the South than in the North. In Alabama and Mississippi, respectively, the case fatality in children under 5 years is 4.0 and 2.9 times that for children 5 years old and over; these ratios may be compared with corresponding ratios of 2.2 for New York, 2.6 for Connecticut, 2.8 for Michigan, and 2.2 for California.

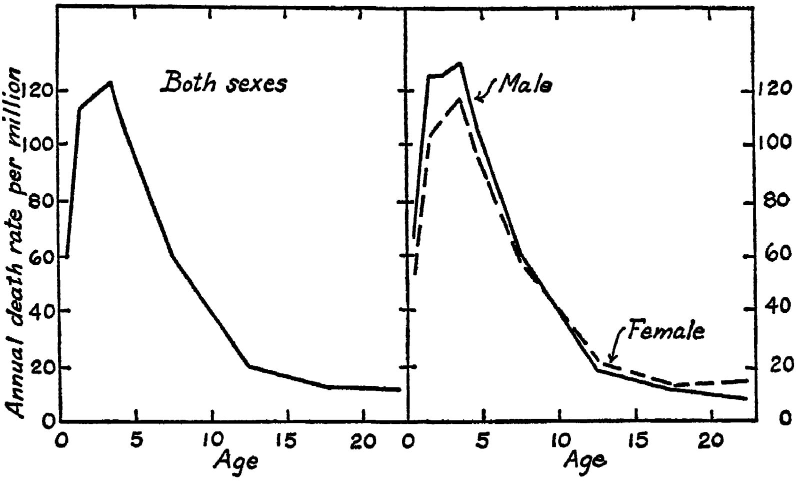

FIGURE 3.—Scarlet fever mortality at specific ages (single years to 5) for each sex—white population in the registration States, 1929–30. (Scales are so made that the rate for all ages under 15 years represents an interval on the vertical scale that corresponds to approximately 10 years on the horizontal scale.)

TABLE 7.—*Variation with age and sex in the case fatality of scarlet fever* [1] *in Alabama, New York, and Connecticut—based on cases reported to health departments and total deaths registered, 1927–32*

Age in years	Deaths per 100 reported cases			Annual death rate per million population			Number of deaths in the 6 years		
	Alabama (white)	New York [2]	Connecticut	Alabama (white)	New York [2]	Connecticut	Alabama (white)	New York [2]	Connecticut
All ages:									
Both sexes	2.05	0.89	0.68	15.7	18.3	11.8	160	523	114
Male	2.61	(3)	(3)	16.1	18.9	12.7	83	271	61
Female	1.67			15.2	17.8	11.0	77	252	53
Both sexes:									
All ages under 15	2.15	.78	.63	41.5	49.6	32.2	153	367	86
Under 1	10.5	4.8	4.0	61.7	37.2	20.2	15	16	3
1	10.6	4.4	8.5	126.6	82.5	46.3	30	36	7
2	4.3	2.0	1.3	91.9	87.1	49.1	23	41	8
3	2.2	1.4	1.1	57.8	89.4	60.0	15	43	10
4	2.7	.7	1.1	93.5	54.3	71.5	23	26	12
Under 5	4.3	1.6	1.4	85.8	70.5	50.2	106	162	40
5–9	1.1	.6	.4	29.6	58.7	32.8	38	151	30
10–14	.8	.4	.5	7.7	21.3	16.7	9	54	16
15–19	.8	.8	.4	1.8	14.0	4.5	2	33	4
20–34	2.5	1.2	.9	2.1	10.2	4.5	5	66	10
35–54	--------	2.5	3.3	--------	6.1	3.9	--------	47	10
55 and over	--------	7.3			2.2	3.1	--------	10	4

[1] Cases from the annual reports of the respective State health departments (see table 4); deaths from Mortality Statistics for the United States (*10*), except that New York deaths are from State reports.

[2] Exclusive of New York City, Buffalo, and Rochester, and exclusive of cases and deaths in State institutions.

[3] Cases not available by sex.

TABLE 8.—*Variation with age and sex in the case fatality of scarlet fever* [1] *in Michigan, California, and Mississippi—based on cases reported to health departments and total deaths registered, 1927–32*

Age in years	Deaths per 100 reported cases			Annual death rate per million population			Number of deaths in the 6 years		
	Michigan	California	Mississippi (white)	Michigan	California	Mississippi (white)	Michigan	California	Mississippi (white)
All ages:									
Both sexes	1.18	0.80	1.34	30.6	11.9	12.2	890	404	[2] 73
Male	1.22	(3)	(3)	29.5	10.9	9.6	446	193	29
Female	1.15			31.9	12.9	14.9	444	211	44
Both sexes:									
All ages under 15	1.16	.70	1.35	82.7	36.8	32.0	698	286	67
Under 5	2.4	1.5	2.5	139.5	48.9	57.3	388	119	40
5–9	.7	.6	.9	78.0	44.4	30.1	228	124	22
10–14	.6	.4	.6	30.0	16.9	7.5	82	43	5
15–19	1.0	.7	.9	17.2	9.3	3.1	43	24	2
20–34	1.1	1.5	1.8	11.7	7.0	2.1	86	61	3
35–54	3.0	2.2	--------	7.2	2.4	--------	53	24	--------
55 and over	11.5	13.0	--------	3.0	1.8	--------	10	9	--------

[1] Cases from the annual reports of the respective State health departments (see table 5); deaths from Mortality Statistics for the United States (*10*).

[2] "All ages" includes one of unknown age.

[3] Cases not available by sex.

IV. SUMMARY

Data on the history of clinical cases and of injections for artificial immunization against scarlet fever at any time and more detailed records during a 12-month period between 1928 and 1931 were obtained on 8,758 white families in 130 localities in 18 States. Each family was visited at intervals of 2 to 4 months to secure the information.

The surveyed families include representation from nearly all geographic sections, from rural, urban, and metropolitan areas, from all income classes, and of both native- and foreign-born persons.

Considering the whole group, a maximum of 4 percent of 10- and 11-year-old children gave a history of injections for artificial immunization against scarlet fever. At 15–19 years, 3 percent gave a history of injections for immunization and 13 percent a history of a clinical attack of scarlet fever (fig. 1).

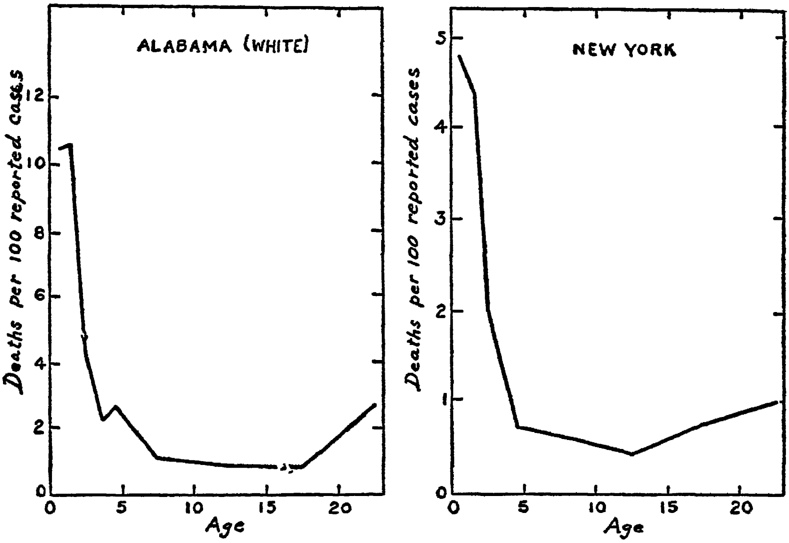

FIGURE 4.—Variation with age (single years to 5) in the case fatality of scarlet fever—deaths per 100 reported cases in Alabama and New York (exclusive of New York City, Buffalo, and Rochester), 1927–32. (Scales are so made that the rate for all ages under 15 years represents an interval on the vertical scale that corresponds to approximately 5 years on the horizontal scale.)

Boys and girls show about the same percentage with a history of injections for scarlet fever immunization and also with a history of a clinical attack.

Injections for immunization during the 12 months of the morbidity study amounted to 1.65 per 1,000 children under 15 years of age.

Scarlet fever case incidence is relatively higher in the pre-school ages in the South than in the North (fig. 2). The peak of scarlet fever mortality in the registration States occurs at 3 years of age (fig. 3).

REFERENCES

Preceding papers in this series

(*1*) Collins, Selwyn D.: Causes of illness in 9,000 families. Pub. Health Rep., 48: 283–308 (March 24, 1933). (Reprint 1563.)

(*2*) ————: Frequency of health examinations in 9,000 families. Pub. Health Rep., 49: 321–346 (Mar. 9, 1934). (Reprint 1618.)

(*3*) ————: Frequency of eye refractions in 9,000 families. Pub. Health Rep., 49: 649–666 (June 1, 1934). (Reprint 1627.)

(*4*) ————: A general view of the causes of illness and death at specific ages. Pub. Health Rep., 50: 237–255 (Feb. 22, 1935). (Reprint 1673.)

(*5*) ————: Age incidence of illness and death considered in broad disease groups. Pub. Health Rep., 50: 507–525 (Apr. 12, 1935). (Reprint 1681.)

(*6*) ————: Age incidence of specific causes of illness. Pub. Health Rep., 50: 1404–1427 (Oct. 11, 1935). (Reprint 1710.)

(*7*) ————: History and frequency of smallpox vaccinations and cases in 9,000 families. Pub. Health Rep., 51: 443–479 (Apr. 17, 1936). (Reprint 1740.)

(*8*) ————: History and frequency of typhoid fever immunizations and cases in 9,000 families. Pub. Health Rep., 51: 897–926 (July 10, 1936). (Reprint 1758.)

(*9*) ————: History and frequency of diphtheria immunizations and cases in 9,000 families. Pub. Health Rep., 51: 1736–1773 (Dec. 18, 1936). (Reprint 1789.)

Other references

(*10*) Annual mortality statistics for the United States. U. S. Bureau of the Census. Government Printing Office, Washington, D. C.

(*11*) Annual reports of the Alabama State Board of Health.

(*12*) Annual reports of the California State Department of Public Health.

(*13*) Annual reports of the Connecticut State Department of Health.

(*14*) Annual report of the Illinois State Department of Health for the year ending June 30, 1930.

(*15*) Annual reports of the Massachusetts Department of Public Health.

(*16*) Annual reports of the Michigan State Department of Health.

(*17*) Annual reports of the Mississippi State Department of Health.

(*18*) Annual reports of the New York State Department of Health, Vol. I.

(*19*) Annual summaries of notifiable diseases published as supplements to the Public Health Reports: (*a*) in States, 1929, Supplement No. 83, and 1930, Supplement No. 104; (*b*) in large cities, 1929, Supplement No. 85, and 1930, Supplement No. 98, and (*c*) unpublished data.

(*20*) Chapin, Charles V.: Changes in type of contagious disease with special reference to smallpox and scarlet fever. Papers of Charles V. Chapin, The Commonwealth Fund, New York, 1934.

(*21*) Collins, Selwyn D.: Age incidence of the common communicable diseases of children: A study of case rates among all children and among children not previously attacked and of death rates and the estimated case fatality. Pub. Health Rep., 44: 763–826. (Apr. 5, 1929). (Reprint 1275.)

(*22*) Dean, J. O., and Pennell, E. H.: Communicable diseases and activities for their control in the Brunswick-Greensville area. Pub. Health Rep., 51: 991–1013 (July 24, 1936). (Reprint 1761.)

(*23*) Dick, G. F., and Dick, G. H.: A skin test for susceptibility to scarlet fever. J. Am. Med. Assoc., 82: 265–66 (Jan. 26, 1924).

(*24*) Dick, G. F., and Dick, G. H.: Scarlet fever toxin in preventive immunization. J. Am. Med. Assoc., 82: 544–45 (Feb. 16, 1924).

(*25*) Donally, H. H.: Scarlet fever morbidity and fatality. Am. J. Dis. of Children, 12: 205–232 (September 1916).

(*26*) Doull, J. A.: Variations in the age distributions of mortality and morbidity from diphtheria, scarlet fever, and certain other diseases in relation to latitude. Am. J. Hyg., 8: 633–648 (July 1928).

(*27*) Fales, W. T.: The age distribution of whooping cough, measles, chicken pox, scarlet fever, and diphtheria in various areas in the United States. Am. J. Hyg., 8: 759–799 (September 1928).

(*28*) Falk, I. S., Klem, Margaret C., and Sinai, N.: The incidence of illness and the receipt and costs of medical care among representative families. Publication No. 26 of the Committee on the Costs of Medical Care, University of Chicago Press, 1933.

(*29*) Fraser, Frieda H.: Prevention and treatment of scarlet fever. Canadian Pub. Health J., **28**: 53–62 (February 1937).

(*30*) Green, H. W.: Analysis of the cases and deaths of the common communicable diseases by age, sex, color, and census tracts in Cleveland, Ohio, 1925–1928. Mimeographed by the Cleveland Health Council, 1929.

(*31*) Pope, Alton S.: Studies on the epidemiology of scarlet fever. Am. J. Hyg., **6**: 389–430 (May 1926).

(*32*) Veldee, M. V.: Antigenic value of scarlet fever streptococcus toxin modified by the action of formalin. Pub. Health Rep., **46**: 693–698 (March 27, 1931). (Reprint 1462.)

(*33*) Veldee, M. V.: Preparation of a scarlet fever streptococcus toxoid and its use in active immunization. Pub. Health Rep., **48**: 549–565 (May 26, 1933) and Canadian Pub. Health J., **24**: 255–268 (June 1933).

(*34*) Wood, H. B.: Case fatality of communicable disease. J. Prev. Med., **6**: 87–93 (March 1932).

DEATHS DURING WEEK ENDED FEB. 26, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Feb. 26, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	8,609	9,954
Average for 3 prior years	9,746	
Total deaths, first 8 weeks of year	71,736	85,530
Deaths under 1 year of age	554	646
Average for 3 prior years	600	
Deaths under 1 year of age, first 8 weeks of year	4,301	5,183
Data from industrial insurance companies:		
Policies in force	69,772,226	69,272,935
Number of death claims	12,091	13,893
Death claims per 1,000 policies in force, annual rate	9.0	10.5
Death claims per 1,000 policies, first 8 weeks of year, annual rate	10.0	11.5

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (....) indicate that cases or deaths may have occurred although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Mar. 5, 1938, and Mar. 6, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Mar. 5, 1938	Week ended Mar. 6, 1937	Week ended Mar 5, 1938	Week ended Mar. 6, 1937	Week ended Mar. 5, 1938	Week ended Mar. 6, 1937	Week ended Mar. 5, 1938	Week ended Mar. 6, 1937
New England States:								
Maine	8	......	3	111	165	26	0	0
New Hampshire	......	......	......	......	33	9	0	0
Vermont	2	2	......	......	172	1	0	0
Massachusetts	5	3	......	......	242	916	8	11
Rhode Island	1	1	......	......	1	318	0	2
Connecticut	8	1	2	21	8	583	1	1
Middle Atlantic States:								
New York	31	42	[1] 18	[1] 56	1,848	593	10	13
New Jersey	14	13	29	67	1,437	2,082	3	4
Pennsylvania	51	30	......	......	7,508	388	8	14
East North Central States:								
Ohio	22	24	......	103	2,170	34	0	9
Indiana	38	11	22	89	955	17	2	1
Illinois	41	44	14	74	6,933	32	5	7
Michigan [2]	33	12	2	2	3,564	73	2	1
Wisconsin	13	6	74	120	4,316	21	2	3
West North Central States:								
Minnesota	3	3	5	8	63	16	2	2
Iowa	5	3	1	27	54	1	1	0
Missouri	13	20	146	382	907	11	1	3
North Dakota	......	1	2	31	8	1	0	0
South Dakota	......	......	2	9	......	3	1	2
Nebraska	17	4	42	......	23	1	18	2
Kansas	11	13	21	55	382	5	2	0
South Atlantic States:								
Delaware	3	......	......	18	26	73	0	0
Maryland [3]	14	9	10	231	66	693	4	6
District of Columbia	7	4	1	3	5	75	2	0
Virginia	23	16	......	......	461	218	5	8
West Virginia	12	5	52	592	531	38	2	7
North Carolina [3]	31	19	36	217	2,659	88	5	6
South Carolina	9	6	481	1,707	610	33	1	0
Georgia [3]	3	11	......	1,176	404	......	1	2
Florida [3]	13	5	1	43	569	2	0	2

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Mar. 5, 1938, and Mar 6, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Mar. 5, 1938	Week ended Mar. 6, 1937	Week ended Mar. 5, 1938	Week ended Mar. 6, 1937	Week ended Mar. 5, 1938	Week ended Mar. 6, 1937	Week ended Mar. 5, 1938	Week ended Mar. 6, 1937
East South Central States:								
Kentucky	13	21	41	508	602	121	6	20
Tennessee	7	10	75	381	725	20	6	9
Alabama	11	19	195	2,487	1,117	14	3	2
Mississippi [2]	8						0	0
West South Central States:								
Arkansas	11	2	184	303	310	1	0	0
Louisiana	10	14	7	143	7	6	0	2
Oklahoma [4]	10	6	222	809	58	34	0	6
Texas [3]	47	45	888	3,745	594	538	4	14
Mountain States:								
Montana		2		29	49	62	0	1
Idaho	1		7	23	3	28	0	0
Wyoming					17	2	0	0
Colorado	15	8			620	3	0	0
New Mexico	3	5	5	95	60	99	0	1
Arizona		7	85	177	9	199	0	1
Utah [2]	6				281	24	1	0
Pacific States:								
Washington	6	5	4	3	8	23	2	1
Oregon			68	121	33	5	0	0
California	27	20	53	1,173	398	90	5	7
Total	606	472	2,798	15,134	41,011	7,620	103	171
First 9 weeks of year	5,803	5,056	27,416	224,549	242,887	45,334	858	1,418

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Mar. 5, 1938	Week ended Mar. 6, 1937	Week ended Mar. 5, 1938	Week ended Mar. 6, 1937	Week ended Mar. 5, 1938	Week ended Mar. 6, 1937	Week ended Mar. 5, 1938	Week ended Mar. 6, 1937	Week ended Mar. 5, 1938
New England States:									
Maine	0	0	12	27	0	0	1	1	89
New Hampshire	0	0	33	27	0	0	0	0	16
Vermont	0	0	16	11	0	0	0	1	42
Massachusetts	0	1	279	224	0	0	1	1	117
Rhode Island	0	0	18	50	0	0	0	1	29
Connecticut	0	0	90	97	0	0	0	0	46
Middle Atlantic States:									
New York	0	1	905	957	0	1	2	8	472
New Jersey	0	1	125	206	0	0	2	2	177
Pennsylvania	1	1	608	826	0	0	3	3	285
East North Central States:									
Ohio	0	0	293	313	23	3	2	0	116
Indiana	1	1	198	246	50	4	1	3	22
Illinois	1	1	699	707	31	12	4	2	121
Michigan [3]	1	1	620	623	16	1	6	6	177
Wisconsin	0	0	170	333	4	9	1	0	141
West North Central States:									
Minnesota	1	0	125	183	28	8	1	0	30
Iowa	0	2	257	365	24	18	0	0	35
Missouri	0	0	233	424	46	89	4	6	39
North Dakota	0	1	29	50	9	8	0	0	24
South Dakota	0	0	24	79	15	2	0	0	17
Nebraska	0	1	67	66	9	5	0	0	19
Kansas	0	0	217	336	28	31	0	0	155
South Atlantic States:									
Delaware	0	0	16	10	0	0	0	0	6
Maryland [3]	0	0	73	31	0	0	2	1	86
District of Columbia	0	1	25	13	0	0	0	0	9
Virginia	1	1	40	30	0	0	1	2	76
West Virginia	1	0	82	45	0	1	4	1	70
North Carolina [3]	1	0	58	44	1	0	0	6	417

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Mar. 5, 1938, and Mar. 6, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Mar. 5, 1938	Week ended Mar 6, 1937	Week ended Mar. 5, 1938	Week ended Mar. 6, 1937	Week ended Mar. 5, 1938	Week ended Mar. 6, 1937	Week ended Mar. 5, 1938	Week ended Mar. 6, 1937	Week ended Mar. 5, 1938
South Atlantic States—Con.									
South Carolina	0	0	4	7	0	0	0	1	96
Georgia [3]	0	0	7	7	7	1	5	1	11
Florida [3]	0	2	8	5	0	0	2	1	
East South Central States:									
Kentucky	0	0	89	58	30	0	2	11	134
Tennessee	0	0	37	20	10	0	0	3	64
Alabama	1	0	11	15	0	0	0	2	24
Mississippi [2]	1	0	9	7	1	0	1	0	
West South Central States:									
Arkansas	0	0	9	17	6	4	1	1	52
Louisiana	0	0	11	3	0	1	21	6	12
Oklahoma [4]	1	0	31	40	30	5	3	5	41
Texas [3]	3	1	127	113	29	1	7	16	304
Mountain States:									
Montana	0	0	31	41	23	22	0	0	28
Idaho	1	1	34	16	9	3	0	0	9
Wyoming	0	0	37	41	0	6	0	1	19
Colorado	0	1	46	73	10	2	1	1	8
New Mexico	0	0	30	26	0	1	2	4	36
Arizona	1	0	6	12	0	0	0	0	40
Utah [1]	0	0	54	13	3	0	0	0	28
Pacific States:									
Washington	0	0	51	41	64	8	1	2	124
Oregon	0	0	68	25	16	28	0	0	7
California	2	3	212	250	12	19	0	6	403
Total	18	21	6,224	7,153	534	293	81	100	4,273
First 9 weeks of year	192	195	54,300	57,724	5,184	2,657	1,067	985	36,089

[1] New York City only.

[2] Period ended earlier than Saturday.

[3] Typhus fever, week ended Mar. 5, 1938, 22 cases, as follows: North Carolina, 2; Georgia, 6; Florida, 3; Texas, 11.

[4] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
January 1938										
Alaska	5	0	18		1		0		1	1
California	11	145	512	10	653	7	9	967	176	29
Hawaii Territory	1	15	49		91		0		0	3
Kansas	3	47	69		1,268	2	3	917	80	8
North Dakota	0	2	8		26		1	105	64	
Washington	2	13	20		133		3	331	158	9
Wisconsin		12	168		4,613		4	836	30	
February 1938										
Arkansas	8	49	850	57	1,297	14	2	49	48	15
Connecticut	0	17	31		57		0	405	0	1
Delaware	0	3			111		0	49	0	0

Summary of monthly reports from States—Continued

January 1938

	Cases
Anthrax:	
Hawaii Territory	1
Botulism:	
Washington	1
Chickenpox:	
Alaska	10
California	2,843
Hawaii Territory	60
Kansas	1,062
North Dakota	132
Washington	901
Wisconsin	2,065
Conjunctivitis:	
Kansas	1
Washington	9
Dysentery:	
California (amoebic)	8
California (bacillary)	15
Hawaii Territory (amoebic)	4
Washington (bacillary)	3
Encephalitis, epidemic or lethargic:	
California	1
Kansas	1
Washington	2
Wisconsin	1
Food poisoning:	
California	21
German measles:	
California	72
Kansas	12
North Dakota	1
Washington	13
Wisconsin	62
Granuloma, coccidioidal:	
California	5
Hookworm disease:	
Hawaii Territory	2
Impetigo contagiosa:	
Alaska	2
Hawaii Territory	13
Kansas	1
Washington	15
Jaundice, epidemic:	
California	3
Leprosy:	
California	1
Hawaii Territory	4
Mumps:	
Alaska	57
California	1,641
Hawaii Territory	6
Kansas	853

January 1938—Continued

	Cases
Mumps—Continued.	
North Dakota	50
Washington	867
Wisconsin	836
Ophthalmia neonatorum:	
California	4
Paratyphoid fever:	
California	2
Plague, bubonic:	
Hawaii Territory	1
Puerperal infection:	
Alaska	1
Rabies in animals:	
California	227
Washington	22
Scabies:	
Kansas	4
Washington	7
Septic sore throat:	
Alaska	2
California	6
Hawaii Territory	2
Kansas	13
Washington	9
Wisconsin	10
Tetanus:	
California	5
Hawaii Territory	3
Trachoma:	
Alaska	3
California	8
Hawaii Territory	16
Trichinosis:	
California	15
Typhus fever:	
Hawaii Territory	3
Undulant fever:	
California	18
Hawaii Territory	1
Kansas	2
North Dakota	1
Washington	3
Wisconsin	4
Vincent's infection:	
Kansas	9
North Dakota	7
Washington	1
Whooping cough:	
Alaska	82
California	1,750
Hawaii Territory	141
Kansas	461
North Dakota	115

January 1938—Continued

	Cases
Whooping cough—Contd.	
Washington	566
Wisconsin	658

February 1938

Actinomycosis:	
Connecticut	1
Chickenpox:	
Arkansas	91
Connecticut	690
Delaware	94
Conjunctivitis:	
Connecticut	5
Dysentery:	
Arkansas (bacillary)	2
Connecticut (bacillary)	1
Encephalitis, epidemic or lethargic:	
Connecticut	2
German measles:	
Connecticut	30
Delaware	2
Mumps:	
Arkansas	41
Connecticut	1,031
Delaware	136
Ophthalmia neonatorum:	
Arkansas	1
Paratyphoid fever:	
Connecticut	2
Rabies in animals:	
Arkansas	27
Connecticut	1
Rabies in man:	
Arkansas	1
Septic sore throat:	
Arkansas	13
Connecticut	27
Trachoma:	
Arkansas	8
Trichinosis:	
Connecticut	4
Tularaemia:	
Arkansas	2
Undulant fever:	
Arkansas	1
Connecticut	5
Whooping cough:	
Arkansas	251
Connecticut	209
Delaware	41

WEEKLY REPORTS FROM CITIES

City reports for week ended Feb. 26, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table. Weekly reports are received from about 700 cities, from which the data are tabulated and filed for reference

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	204	941	153	5,098	999	2,339	24	421	18	1,223	------
Current week [1]	151	197	45	12,937	758	1,678	26	371	17	1,007	------
Maine:											
Portland	0	------	0	3	2	0	0	0	0	13	21
New Hampshire:											
Concord	0	------	0	2	2	0	0	0	0	0	12
Manchester	0	------	2	0	2	27	0	1	0	0	20
Nashua	0	------	0	0	1	0	0	0	0	0	7
Vermont:											
Barre	0	------	0	1	------	------	------	4	------	------	5
Burlington	1	------	0	16	0	0	0	0	0	3	10
Rutland	0	------	------	0	------	0	0	------	0	0	10

[1] Figures for Richmond, Va., estimated; report not received.

City reports for week ended Feb. 26, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Massachusetts:											
Boston	0	------	1	132	36	83	0	16	0	7	245
Fall River	0	------	0	0	2	1	0	1	0	14	31
Springfield	0	------	0	0	6	5	0	0	0	9	33
Worcester	0	------	0	2	4	19	0	1	0	12	46
Rhode Island:											
Pawtucket	0	------	0	0	1	5	0	0	0	0	21
Providence	0	------	0	8	13	7	0	2	0	21	69
Connecticut:											
Bridgeport	0	------	0	0	2	19	0	0	0	0	32
Hartford	0	------	0	1	2	22	0	3	0	0	51
New Haven	0	------	0	1	1	4	0	0	0	2	29
New York:											
Buffalo	0	------	0	2	9	32	0	3	0	0	134
New York	27	------	8	543	149	342	0	82	2	213	1,517
Rochester	0	3	0	10	5	11	0	1	0	2	76
Syracuse	0	------	0	20	7	7	0	3	0	14	61
New Jersey:											
Camden	3	------	0	51	1	0	0	------	1	1	31
Newark	1	------	0	14	9	22	0	3	0	24	94
Trenton	0	------	0	4	4	2	0	3	0	9	36
Pennsylvania:											
Philadelphia	8	8	3	615	37	121	0	23	0	19	518
Pittsburgh	3	------	0	397	21	39	0	9	1	17	104
Reading	0	------	1	4	2	2	0	1	0	2	34
Scranton	1	------	------	61	------	5	0	------	0	1	------
Ohio:											
Cincinnati	4	------	0	3	8	9	0	7	0	8	132
Cleveland	2	12	2	257	19	44	0	20	0	54	193
Columbus	3	------	0	162	5	7	0	2	0	2	67
Toledo	2	2	1	146	2	4	1	2	0	23	65
Indiana:											
Anderson	0	------	0	14	0	5	2	1	0	1	9
Fort Wayne	0	------	0	43	1	4	0	0	0	2	23
Indianapolis	16	------	2	103	16	18	0	4	0	5	114
South Bend	0	------	0	8	5	3	0	0	0	0	25
Terre Haute	2	------	0	18	0	8	0	0	0	0	23
Illinois:											
Alton	0	------	0	1	2	6	0	1	0	0	4
Chicago	7	11	2	3,327	53	265	0	45	1	35	718
Elgin	0	------	0	3	2	7	0	0	0	0	6
Moline	1	------	0	55	2	11	0	0	0	1	6
Springfield	0	------	0	170	3	3	2	1	0	0	20
Michigan:											
Detroit	7	------	0	2,211	13	172	0	15	2	83	262
Flint	1	------	0	5	6	37	0	0	0	24	20
Grand Rapids	0	------	0	29	3	20	0	0	0	1	32
Wisconsin:											
Kenosha	0	------	0	1	0	0	0	0	0	21	7
Madison	0	------	------	0	------	5	0	------	0	0	15
Milwaukee	2	1	1	2,552	3	21	0	0	0	29	98
Racine	0	------	0	20	1	10	0	0	0	3	13
Superior	0	------	0	4	0	2	0	0	0	2	12
Minnesota:											
Duluth	0	------	0	0	3	5	0	0	0	4	30
Minneapolis	0	------	0	5	5	20	1	1	0	4	85
St. Paul	0	------	0	0	4	4	3	2	0	3	64
Iowa:											
Cedar Rapids	0	------	------	0	------	0	0	------	0	1	------
Davenport	0	------	------	12	------	1	0	------	0	0	------
Des Moines	0	------	------	2	------	32	0	------	0	0	26
Sioux City	0	------	------	0	------	3	0	------	0	3	------
Waterloo	2	------	------	17	------	11	1	------	0	1	------
Missouri:											
Kansas City	0	------	0	200	8	20	0	4	0	2	89
St. Joseph	0	------	0	32	2	4	0	0	0	0	26
St. Louis	8	------	0	27	12	39	2	5	0	7	234
North Dakota:											
Fargo	0	------	0	1	1	1	0	0	0	2	7
Grand Forks	0	------	------	1	------	0	1	------	0	0	------
Minot	0	------	------	0	------	0	6	------	0	0	8
South Dakota:											
Aberdeen	0	------	------	0	------	2	0	------	0	2	------
Nebraska:											
Lincoln	0	------	------	1	------	18	0	------	0	0	------
Omaha	0	------	1	2	3	4	0	1	0	0	39

City reports for week ended Feb. 26, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Kansas:											
Lawrence	0	2	0	0	1	0	0	0	0	1	5
Topeka	0	------	0	8	3	1	0	0	0	23	17
Wichita	0	------	0	4	11	2	0	3	0	5	40
Delaware:											
Wilmington	0	------	0	9	3	2	0	0	0	3	21
Maryland:											
Baltimore	4	14	1	2	27	33	0	7	0	34	222
Cumberland	0	------	0	0	1	2	0	1	0	1	15
Frederick	0	------	0	0	0	0	0	0	0	0	4
Dist. of Columbia:											
Washington	10	0	0	4	22	18	0	4	1	4	157
Virginia:											
Lynchburg	1	------	0	0	4	0	0	0	0	3	12
Norfolk	0	4	0	169	5	7	0	1	0	7	28
Richmond	------	------	------	------	------	------	------	------	------	------	------
Roanoke	3	------	0	3	0	4	0	0	0	0	26
West Virginia:											
Charleston	0	2	0	189	1	0	0	0	0	8	7
Huntington	0	------	------	14	------	0	0	------	0	0	------
Wheeling	0	------	0	0	8	0	0	1	0	0	36
North Carolina:											
Gastonia	0	------	------	4	------	0	0	------	0	3	------
Raleigh	0	------	0	32	10	0	0	0	0	8	21
Wilmington	0	------	0	109	1	2	0	0	0	13	11
Winston-Salem	0	------	0	2	1	0	0	2	0	29	14
South Carolina:											
Charleston	0	29	0	117	1	0	0	0	1	0	21
Florence	0	------	0	27	0	0	0	1	0	0	15
Greenville	0	------	0	0	3	0	0	0	0	24	21
Georgia:											
Atlanta	0	8	1	173	15	6	0	3	0	5	88
Brunswick	0	------	0	0	0	0	0	0	0	0	4
Savannah	0	36	2	81	2	0	0	2	0	3	31
Florida:											
Miami	0	------	0	51	5	0	0	0	0	4	45
Tampa	3	------	0	6	0	3	1	0	0	0	24
Kentucky:											
Ashland	0	------	------	1	------	0	0	------	0	3	------
Covington	0	------	0	1	0	4	0	2	0	0	21
Lexington	0	3	1	1	3	0	0	1	0	2	21
Louisville	1	1	0	128	9	45	0	8	0	9	66
Tennessee:											
Knoxville	2	------	0	44	2	2	0	1	2	2	24
Memphis	0	------	1	256	7	1	0	6	0	0	81
Nashville	0	------	0	127	4	3	0	1	0	5	41
Alabama:											
Birmingham	3	24	1	126	7	3	0	4	0	1	65
Mobile	0	------	1	8	2	0	0	0	0	0	26
Montgomery	0	1	------	87	------	0	0	------	0	2	------
Arkansas:											
Fort Smith	0	------	------	22	------	1	0	------	0	0	------
Little Rock	0	------	0	109	5	1	2	2	0	0	------
Louisiana:											
Lake Charles	0	------	0	0	1	0	0	1	0	3	6
New Orleans	5	4	4	0	14	9	0	11	7	7	149
Shreveport	1	------	0	7	12	4	0	2	0	0	49
Oklahoma:											
Oklahoma City	1	------	0	0	6	5	1	0	0	0	44
Tulsa	0	------	------	0	------	3	9	------	0	0	------
Texas:											
Dallas	4	4	4	6	6	10	0	4	0	8	87
Fort Worth	0	------	0	0	5	9	0	1	0	4	34
Galveston	1	------	0	0	1	2	0	8	0	0	18
Houston	1	------	0	0	11	7	0	2	1	0	96
San Antonio	3	------	2	0	12	0	0	5	0	0	77
Montana:											
Billings	0	------	0	1	5	1	0	1	0	0	13
Great Falls	0	------	0	0	1	0	1	0	0	2	7
Helena	0	------	0	0	1	3	0	0	0	4	6
Missoula	0	2	0	0	1	0	0	0	0	1	5
Idaho:											
Boise	0	------	0	1	1	1	3	0	0	0	3

City reports for week ended Feb. 26, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Colorado:											
Colorado Springs	4	------	0	0	4	4	0	3	0	2	21
Denver	5	------	0	419	15	23	0	3	0	1	98
Pueblo	0	------	2	0	3	2	0	0	0	1	16
New Mexico:											
Albuquerque	0	------	0	8	2	3	0	2	0	5	10
Utah:											
Salt Lake City	0	------	0	100	2	8	1	0	0	2	------
Washington:											
Seattle	0	------	1	2	3	3	1	0	0	50	95
Spokane	0	3	3	0	4	0	1	1	0	7	26
Tacoma	0	------	0	0	3	7	2	0	0	18	36
Oregon:											
Portland	1	3	1	1	6	24	5	2	0	0	78
Salem	------	3	------	------	------	0	3	------	0	0	------
California:											
Los Angeles	10	30	0	10	19	39	6	23	0	14	352
Sacramento	2	------	0	0	2	3	0	4	0	43	28
San Francisco	1	------	1	2	14	15	0	10	0	34	194

State and city	Meningococcus meningitis		Polic-myelitis cases
	Cases	Deaths	
Massachusetts:			
Worcester	1	1	0
Rhode Island:			
Providence	1	1	1
New York:			
Buffalo	1	0	0
New York	5	0	0
Syracuse	1	1	0
Pennsylvania:			
Philadelphia	1	0	0
Ohio:			
Cincinnati	2	0	0
Illinois:			
Chicago	0	1	0
Moline	1	1	0
Michigan:			
Detroit	2	0	0
Minnesota:			
St. Paul	1	0	0

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Iowa:			
Des Moines	1	0	0
Missouri:			
St. Louis	1	0	0
District of Columbia:			
Washington	0	0	1
West Virginia:			
Charleston	1	1	0
Albama:			
Birmingham	4	0	0
Arkansas:			
Little Rock	0	1	0
Louisiana:			
Shreveport	0	1	0
Colorado:			
Denver	1	1	0
California:			
Los Angeles	0	0	1

Encephalitis, epidemic or lethargic.—Cases: New York, 1; Milwaukee, 1; New Orleans, 1.
Pellagra.—Cases: Wichita, 1; Atlanta, 2; Savannah, 2; Tampa, 1; Birmingham, 7; San Francisco, 1.
Rabies in man.—Deaths: Houston, 1.
Typhus fever.—Cases: Charleston, S. C., 1; Savannah, 1; Montgomery, 1.

FOREIGN AND INSULAR

BELGIUM

Vital statistics—Year 1936.—Following are vital statistics for Belgium for the year 1936:

	Number	Rate per 1,000 inhabitants
Total deaths	106, 190	12. 75
Deaths under 1 year	9, 953	[1] 7. 85
Deaths from:		
Alcoholism	111	. 013
Appendicitis	689	. 083
Cancer and other malignant tumors	9, 166	1. 100
Cerebral hemorrhage	8, 398	1. 008
Diabetes mellitus	1, 589	. 191
Diarrhea and enteritis (under 2 years of age)	931	. 112
Diarrhea and enteritis (2 years and over)	257	. 031
Diphtheria	377	. 045
Heart disease	17, 707	2. 125
Deaths from—Continued.		
Influenza	1, 915	0. 230
Malaria	12	. 001
Measles	336	. 040
Meningitis (nontubercular)	907	. 109
Nephritis	2, 668	. 320
Pneumonia	7, 037	. 845
Scarlet fever	124	. 015
Septicemia and puerperal infections	199	. 024
Syphilis	39	. 005
Tuberculosis (all forms)	5, 992	. 719
Typhoid fever and paratyphoid fever	97	. 012
Whooping cough	433	. 052

[1] Per 100 live births.

DENMARK

Notifiable diseases—October-December 1937.—During the months of October, November, and December, 1937, cases of certain notifiable diseases were reported in Denmark as follows:

Disease	October	November	December
Cerebrospinal meningitis	3	4	2
Chickenpox	38	73	112
Diphtheria and croup	142	153	107
Epidemic encephalitis	3	3	3
Erysipelas	261	268	277
German measles	5	29	19
Gonorrhea	953	912	687
Influenza	4, 689	4, 818	5, 494
Malaria	5	7	11
Measles	479	1, 192	2, 353
Mumps	338	536	705
Paradysentery	80	46	63
Paratyphoid fever	21	13	3
Poliomyelitis	265	63	17
Puerperal fever	16	21	20
Scabies	1, 679	1, 808	1, 529
Scarlet fever	1, 491	1, 488	1, 013
Syphilis	66	53	53
Tetanus, neonatorum	4	2	3
Tetanus, traumatic	--------	1	--------
Typhoid fever	4	2	1
Undulant fever (Bact. abort. Bang)	42	54	35
Weil's disease	8	3	--------
Whooping cough	664	964	877

FINLAND

Communicable diseases—January 1938.—During the month of January 1938, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	291	Poliomyelitis	13
Influenza	3,329	Scarlet fever	853
Lethargic encephalitis	1	Typhoid fever	18
Paratyphoid fever	17	Undulant fever	1

GERMANY

Vital statistics—Third quarter 1937.—Following are vital statistics for Germany for the third quarter of 1937:

Number of marriages	152,839
Number of live births	306,250
Number of live births per 1,000 population	18.1
Number of stillbirths	7,028
Total deaths	170,931
Deaths per 1,000 population	10.1
Deaths under 1 year of age	17,414
Deaths under 1 year of age per 100 live births	5.5

JAMAICA

Communicable diseases—4 weeks ended February 19, 1938.—During the 4 weeks ended February 19, 1938, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox	64	19	Puerperal fever	---------	1
Diphtheria	1	2	Tuberculosis	29	83
Dysentery	2	3	Typhoid fever	7	64
Erysipelas	---------	3			

NEWFOUNDLAND AND LABRADOR

Vital statistics—Year 1936.—The following table shows the births, and deaths from certain causes in Newfoundland and Labrador for the year 1936:

	Number	Rate per 1,000 population		Number	Rate per 1.000 population
Births	7,342	25.2	Deaths from—Continued.		
Total deaths	3,802	13.0	Measles	40	--------
Deaths under 1 year of age	826	[1] 112.7	Puerperal causes	46	[1] 6.3
Deaths from:			Scarlet fever	1	--------
Cancer	278	.954	Tuberculosis	577	1.98
Diphtheria	19	--------	Typhoid fever	10	--------
Dysentery	26	--------	Whooping cough	96	--------
Influenza	54	--------			

---

[1] Per 1,000 live births.

SWEDEN

Notifiable diseases—January 1938.—During the month of January 1938, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	9	Poliomyelitis	[1] 41
Diphtheria	25	Scarlet fever	1,845
Dysentery	1	Syphilis	25
Epidemic encephalitis	2	Typhoid fever	3
Gonorrhea	932	Undulant fever	18
Paratyphoid fever	6	Weil's disease	2

[1] Includes 2 cases nonparalytic at time of notification.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for February 25, 1938, pages 313-327. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

India—Vizagapatam.—During the week ended February 26, 1938, 1 case of cholera was reported in Vizagapatam, India.

Indochina (French).—During the week ended February 26, 1938, 54 cases of cholera were reported in Annam Province, and 14 cases in Tonkin Province, French Indochina.

Typhus Fever

On vessel—S. S. Blackhill.—On January 22, 1938, 1 case of typhus fever was reported on the S. S. *Blackhill* at Philippeville, Algeria. The patient died on February 6, 1938.

Yellow Fever

Belgian Congo—Saratumba.—On February 27, 1938, 1 suspected case of yellow fever was reported in Saratumba, near Zongo, Belgian Congo.

Brazil.—Yellow fever was reported in Brazil as follows: *Minas Geraes State*—Bicas, January 29, 1938, 1 death, February 2, 2 deaths, February 3, 1 death, first appearance; Juiz de Fora, February 1, 1 death, February 2, 1 death, February 3, 1 death, February 4, 1 death, February 6, 1 death; Machado, February 1, 1 death; Merces, January 31, 1 death, first appearance; Rio Novo, February 6, 1 death; Sao Joao Nepomuceno, February 2, 1 death, first appearance. *Para State*—Cameta, January 20, 1 death. *Rio de Janeiro State*—Areal, January 28, 1 death, first appearance; Vassouras, January 30, 1 death, February 1, 1 death, first appearance. *Santa Catharina State*—Hansa, February 3, 1 death, first appearance.

Ivory Coast—Abidjan.—On February 19, 1938, 1 suspected case of yellow fever was reported in Abidjan, Ivory Coast.

X

UNITED STATES TREASURY DEPARTMENT

PUBLIC HEALTH REPORTS

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IN THIS ISSUE

Health Service Data Gathered by the Family Survey Method
Dental Care Received by a Representative Urban Population

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UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg Gen ROBERT OLESEN, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PUBLIC HEALTH REPORTS

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THE VALIDITY OF HEALTH SERVICE DATA GATHERED BY THE FAMILY SURVEY METHOD[1]

By ELLIOTT H. PENNELL, *Associate Statistician*, and HAZEL O'HARA, *United States Public Health Service*

INTRODUCTION

The personal interview as a method of gathering data is probably as old as speech itself. In this age of surveys it is quite commonly used by foundations, private enterprises, and governments. Many an analysis of health, behavior, income, education, and other matters pertaining to the citizenry, how they live and what opinions they hold, has had its beginnings in a house-to-house canvass.

Information gathered in this manner has been taken largely on faith. When a survey worker rings the doorbell of a home and succeeds in gaining an interview with a responsible member of the household, it is generally assumed that he comes away with information that is approximately correct. Usually this assumption has had to suffice, in lieu of any means of checking the authenticity of data thus amassed.

Such a check, however, has been possible in one of the surveys conducted by the United States Public Health Service, and it corroborates in an interesting fashion the common belief that within reasonable limits the personal interview is a dependable method of gathering information of certain types.

This survey, which was conducted in three southern counties, is part of a series of studies which the United States Public Health Service has been conducting in regard to the activities of rural health departments, with the object of determining how suitable their programs are for raising the general level of health among the people for whom they function.

The counties may be described as essentially rural, with a considerable number of inhabitants residing in communities representing suburban development from a populous urban area. The population was native-born for the most part, with 10 to 15 percent of the families being Negro. From 50 to 80 percent of the families in the different counties had gardens or were engaged in farming on some scale, although only about one-fourth of these reported farming as their principal source of income. The economic level of the households in each county was doubtless above that found in most rural counties.

---

[1] From the Office of Public Health Methods, National Institute of Health, in cooperation with the Division of Domestic Quarantine.

METHOD OF STUDY

The studies were carried on through a combination of two approaches. Clerical personnel of the United States Public Health Service spent the study year in the offices of the three health departments under review. They copied for that period records of the daily activities of the personnel—the health officer, the nurses, and whoever else might serve the population as a member of the health department staff or under its auspices. As the records were copied, a current indexed summary was kept to show the distribution of service to individuals and families in the county.

Toward the end of the study period a sample of families representative of the population in its different degrees of economic circumstance was chosen in each county for personal interview on the family way of living, illnesses over the year just past, medical care, and particularly all services received from the members of the health department staff.

The present discussion is set forth primarily as an appraisal of the family survey as a means of gathering health service data. For that restricted purpose the material at hand will be presented briefly to show the difference between what service the health departments recorded as given to the surveyed families during the 12 months of the study, and what service the families reported as received from the health departments during essentially the same period. The comparisons will cover the following topics: The proportion of the population served by members of the health department, the types of service rendered, and the places of service.

Approximately 1,000 families were surveyed in each county. The sample in County A represents about 18 percent of the population within the area served by the health department, in County B about 10 percent, and in County C about 14 percent.

VALIDITY OF THE SURVEY DATA

Proportion of families served.—The percentage of surveyed families receiving service from the separate members of the health department staffs is shown in table 1. The slight differences between the percentages determined from the health department data and those arrived at from the facts supplied by the family informants point to remarkably good recollection of contacts with the health departments. It will be noted that in general the percentages under "Reported" are slightly higher than those under "Recorded" for individual members of the health department staff, but that the "Reported" and "Recorded" figures for "All personnel" are practically the same.

TABLE 1.—*Percentage of surveyed families in each county receiving health department services of any type as determined from (a) data recorded by the health department, and (b) data reported by the family informants*

Health department personnel serving families	County A		County B		County C	
	Percent of surveyed families receiving service		Percent of surveyed families receiving service		Percent of surveyed families receiving service	
	Recorded	Reported	Recorded	Reported	Recorded	Reported
All personnel	52.3	54.4	27.7	29.0	71.0	73.0
Health officer	38.4	42.3	9.1	12.8	34.5	44.5
Public health nurse	47.2	43.7	23.4	26.7	55.3	58.5
Sanitation officer	11.0	16.9	6.2	2.1	35.6	35.9
School dentist [1]	35.3	41.5	----------	1.7	14.5	28.8

[1] No dental service provided by the health department in County B.

The nurses in each county rendered a variety of services in that they had a share in nearly all of the activities of the health departments except the work of the sanitation officer. They carried out a large part of the work incident to the health supervision and maternity programs; assisted the health officer in school examinations; aided the dentist, where there was one; and helped in the immunization and communicable disease programs. That their participation in these services was recognized by the families is indicated by the very general reporting of the public health nurse for all but the sanitation services. In all three counties about the same percentage of families reported service from the public health nurses as was recorded by the health department.

The families reported service from the health officer and from the school dentist more frequently than it was recorded. In County A the percentage of families reporting service from the sanitation officer was considerably in excess of the percentage recorded, and in County B it was somewhat less. In County C the two sets of data agreed as to the proportion of families receiving sanitation services.

The explanation for much of this variation is inherent in the nature of the subject matter covered by the data. For example, the discrepancies in regard to services by the health officer and the school dentist undoubtedly represent a certain amount of misapprehension among the family informants as to whether the nurse performed certain school services alone or as an assistant to the health officer or school dentist. In other words, the facts in most cases are second-hand to the informant. There were many instances wherein the health department records indicated a school inspection with only the nurse in attendance, or a dental examination by the school dentist, and the family report credited the service to the health officer and nurse, the school dentist and nurse, or all three.

In County B, 18 families reported dental services received, when in fact no dental care was given in the schools in that county. The health officer and nurses in making examinations probably looked at the children's teeth, and no doubt some of this service was translated into dental care when reported by the family.

Further analyses of the data failed to reveal any explanation for the excess in County A and the deficiency in County B in the percentage of families reporting service from the sanitation officer. It is possible that in County B, where much of his work dealt with nuisances, many of the individuals served in this respect did not think of the situation in terms of service from the health department. In County C, where the family reports tallied closely with the records on sanitation services, the sanitation officer was occupied most of the year with supervision of a special privy-construction program. Inasmuch as this work necessitated that the owner or tenant be interviewed and that he be requisitioned for materials when repairs or construction were needed, one can understand why this work was so well remembered.

Close agreement between the two sets of data was shown when the families were considered by race, and also by type of locality in which they live. The divisions by race are two: White and Negro; and by locality, three: Suburban areas, small villages, and open country. Other possible variation was also sought by dividing the families into the four economic groups of comfortable, moderate, poor, and very poor, but each group showed about the same recollection of health department contacts.

Types of service rendered.—On the second division of data—types of service—the percentages refer to individuals rather than to family groups. Over 14,000 persons were included in the 3 samples of families and the possibility of error in reporting on them rather than on the 2,995 families to which they belong is, of course, much greater. In the family summaries in table 1 no account was made of services to separate individuals; if one member of a family or half a dozen members were served, the family was counted as having had contact with the health department.

Then, too, a large proportion of the services accounted for in table 2 was rendered through group work in the schools and is subject to considerable error in the reporting process. Common experience tells us that some children on coming home from school faithfully report the happenings of the day, and others fail to mention them. Some mothers listen carefully; others do not. It is not unusual for a woman to say that the several children in her family were all examined in school simply because she vaguely remembers that 3 months earlier little Johnny had said that the dentist examined his teeth that day at school.

In view of these opportunities for error, it is submitted that the percentages in table 2 on types of service do not show any invalidating divergencies between the family account and the health department record of what took place during the study year. As in table 1, the percentages are practically the same in the total, although they show considerable variation on specific items. The general consistency between the two sets of data may be described as remarkably high when one considers the number of services involved and the amount of time spanned by the informant in picking up these small details, most of which she did not experience personally.

The relatively high percentage of individuals reporting examinations and dental services is occasioned in part by the frequent reporting of a combined physical and dental examination when in fact only one or the other had been given. Furthermore, the families were inclined to report staff services rendered in specialized clinics as examination by individual members of the health department.

TABLE 2.—*Percentage of individuals in surveyed families receiving health department services of different types as determined from (a) data recorded by the health department, and (b) data reported by the family informants*

Type of health department service	County A		County B		County C	
	Percent of individuals receiving service		Percent of individuals receiving service		Percent of individuals receiving service	
	Recorded	Reported	Recorded	Reported	Recorded	Reported
All types of service	23.2	21.4	11.3	13.3	28.7	23.9
Examinations (and inspections)	14.0	19.8	4.8	9.8	11.8	16.1
Dental examinations [1] or corrections	14.3	19.3	----------	.7	4.5	12.1
Immunizations	5.1	1.7	2.8	2.8	9.3	10.0
Other services	4.0	1.5	6.6	3.5	15.5	13.8

[1] No dental service provided by the health department in County B.

Immunization of preschool and school children in County A was frequently given at the time of examination by the health officer and the nurse. While the families generally reported the examination, they often failed to report specifically that immunization service was rendered. This is in keeping with the general tendency of the families to remember the fact of service but to confuse the details.

Those services having to do with health supervision, maternity care, and the control of tuberculosis and venereal disease are grouped in table 2 under "Other." They were, as a rule, understated by the families, or perhaps to some extent reported under more general categories, such as "Examinations." The numbers in these groups are too small to yield percentages of any determining value, but one point relevant to the discussion might be made. It is likely that errors in reporting a series of services must occur, and an individual reached by one of the above programs frequently receives more than a single service. For example, the five trips that the nurse made to Mrs. Smith down on the river road are entered on the records of the health department under the heading of "Maternity and infant service," but Mrs. Smith may remember only that the nurse dropped by on several occasions for a little conversation about the baby.

The data also reveal another circumstance that makes for discrepancy in this particular survey. In County C, 32 individuals in the family sample were recorded in the offices of the health department as having received treatment for venereal diseases, while the informants reported only 2 individuals as having received this service. No venereal-disease service was reported by the family informants in Counties A and B, although several members of these two groups of families were recorded as having received treatment. The indications are that on matters conveying a suggestion of moral turpitude data will be poorly reported. In the majority of surveys such questions probably play no part; in surveys of health they might conceivably be productive of unreliable information.

Places where service was rendered.—The third topic covered by this discussion is the places of service, of which there are three—the homes, the schools, the clinics. The health department records show that 17 percent of the sampled families were contacted in the home at some time during the year. The information gathered from the families yields 14 percent on this point. It is entirely possible that seemingly casual calls by a member of the health department, such as a visit by the nurse to deliver a birth certificate, may not have been considered by the family as a health department contact.

The discrepancy falls the other way on service in schools, the family data showing 36 percent and the health department records 31 percent. This is in line with the consistent overstatement of services rendered in the schools.

The report on the clinics is less satisfactory. The health department recorded 19 percent of the sample of families as having been seen at clinics, and the families reported 9 percent. In explanation of this, it might be pointed out that certain services, involving a goodly number of individuals, were classified as clinic services by the health department but may not necessarily have been regarded as such by the family informants. Clinic is, of course, a generic term used freely by the medical profession to denote a place of organized group treatment, but the lay person is likely to refer to such places by their specific names. In County A a large number of adults applying for work on certain Public Works projects were given physical examinations by local physicians in clinics organized by the health department for that purpose. Relatively few of those in the surveyed families who were so examined reported the service as a clinic service and many of them failed to recognize it as a health department service at all. In County C many of the immunizations and Schick tests were reported as services received in the school or the office of the health department but were recorded by the health department as clinic activities.

Such a confusion of terms would not operate in every survey. Indeed, it is believed that this particular study constitutes a fairly severe test of the reliability of the family canvass. The informant was obliged to recall for a period of 12 months, personnel, types of service, and places of service. Many of the items she could know only if they had been reported to her. Remembrance of circumstances centering in the home, such as the illness of the members, would be much simpler than recalling the itemized relationship of the family and the individuals thereof with an outside agency.

There are other possibilities for error in data gathered from a canvass of families which it might be well to mention. The results shown in the foregoing pages might have been of a different character had many of the interviews been given by someone other than the female head of the household. The male head, a grandparent, or some other person might have been less informed and have recollected fewer contacts. It is not believed, however, that this is a circumstance so frequent as to constitute an obstacle, since a person making a house-to-house canvass does in most cases interview the female head of the family.

Again, a variation of some significance would have to be allowed for if there were extreme differences in the type of person who conducted the interviews. Workers vary in point of understanding and deftness in eliciting information, and the data which they secure will deviate accordingly. To minimize such variations only a few workers under the direction of a single supervisor were selected to conduct this series of studies. The workers were closely comparable in training and ability and had had extensive field experience. After a period of instruction and drill on the technique to be followed, each worker accompanied by the supervisor in charge conducted a series of interviews to insure that the same procedure was followed by all workers. The areas were then so assigned that most of the workers interviewed white and colored families and families residing in suburban areas, in small towns and villages, and on isolated rural premises.

SUMMARY

In summary of the foregoing, it seems that the family canvass is reliable within the limits that have generally been accepted. A comparison of the data furnished by these families with data taken from the health department records indicates that the family informants presented from memory a close approximation of that which the health workers had set down as having taken place. Differences between the "Reported" and "Recorded" figures were usually associated with items calling for knowledge beyond the experience of the informant. The results concerning clinics were the least satisfactory, for the reason that many of the informants did not apply the term "clinic" to some familiar place where group service had been rendered. The overstatement of service from the health officer and school dentist largely reflects failure to distinguish between services classified by members of the health department staff as examinations, inspections, and dental treatments. School services rendered by the health officer, nurse, or school dentist, working alone, were frequently reported as physical examinations or physical and dental examinations with two or more staff members in assistance. The informants reported within 3 percent of the recorded figures the proportion of families served in the home, and to within 5 percent the proportion served in the school.

The comparisons afforded by their statements are offered, therefore, in testimony of the worth of the family survey as a means of gathering data relating to health service.

A STUDY OF DENTAL CARE IN DETROIT, MICH.

By Rollo H. Britten, *Senior Statistician, United States Public Health Service*[1]

In connection with the National Health Survey[2] a supplementary schedule was filled out in Detroit in order to obtain data regarding the extent and nature of dental care received in the general population of a large city. The Health Survey, which depended upon house-to-house canvassing for the collection of facts, was devoted to determining the amount and kind of serious illness and chronic disease and the amount of medical care received during the period of 1 year prior to the date of the canvass in about 84 cities and some rural areas in 19 States. The relation of the data to population and environmental factors was a major aspect.

The supplementary schedule relating to dental care in Detroit, which was filled out in the course of the regular interview, was designed to give information of a character which was not available from the original schedule. The questions on this supplementary schedule covered the following points: (*a*) When the person last saw a dentist

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[1] From the Division of Public Health Methods, National Institute of Health.

[2] The National Health Inventory, of which the survey was a part, was executed by the U. S. Public Health Service, with the aid of grants from the Works Progress Administration. The project was carried out under the general direction of Dr. L. R. Thompson, Director of the National Institute of Health, George St. J. Perrott, Project Director, and Clark Tibbitts, Field Director. Others concerned with the technical aspects of the Health Survey were Selwyn D. Collins, Principal Statistician, and the author of this report. The dental survey in Detroit was made on request of the Medical and Dental Bureau of Wayne County, Dr. O. W. White, Chairman, Professional Advisory Committee.

(exclusive of visits for cleaning of teeth only);[3] (*b*) The kind of dental service received during the period of 1 year [4] (extraction, filling, replacement,[5] treatment [6] of gums).[7] The color, occupation, and industry of the household head, and the sex and age of the individual, were also entered on the schedule.

The house-to-house canvass was made in the winter of 1935–36, the work extending over a period of about 5 months. Households were selected on a sampling basis to be representative of those in the city, the group consisting of about 20,000 families.[8] The dental schedule was not added until after the house-to-house canvass had been made of about 1,000 households; but it was not thought necessary to make return visits to secure the dental information from these households, since the remaining 19,000 households were regarded as an entirely adequate sample.

The information was usually given for all persons in a household by a member who was regarded as competent to answer the questions. The enumerators, who were selected from relief rolls, were carefully trained and the work was thoroughly checked. There is every reason to believe that the procedure afforded the degree of accuracy requisite for this type of survey and that the errors in the data are largely those involved in the difficulty a person giving the information would have in recalling events which occurred some time before. The questions were simple and could be answered without ambiguity.

The population surveyed, excluding persons under 3 years of age on their last birthday, was 70,554. Because of the method of sampling, this group is regarded as being representative of the whole population of Detroit with respect to dental care. Among these persons about a third [9] were reported as having been to a dentist during the year preceding the date of the canvass (referred to in this paper as "study year"). Of these, 11 percent received no dental service other than the extraction of teeth. In the belief that extractions frequently represent the treatment of economic necessity rather than the treatment of choice, they have not been included in most of the accompanying tables.

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[3] The entry was made in years, with fractions for less than 1 year (2/12, 1/52). Thus there was little chance that an entry meant for a number of years would be taken as meaning a number of months. A special symbol was used for "Never having been to dentist." Throughout this paper dental service reported will be understood to be exclusive of visits for cleaning of teeth only.

[4] One or more of these items could be checked for one individual, but only one check was possible for a single type of service. The information obtained, therefore, was in regard to the number of persons making one or more visits to the dentist during the year for any one of these types of treatment or for any combination of them.

[5] The enumerator was instructed to ask whether any teeth were replaced with plates, bridges, or crowns during the year.

[6] The enumerator was instructed to ask whether there were any visits to a dentist for treatment of gums or mouth conditions. He was instructed *not* to include visits for cleaning of teeth only.

[7] A further question dealt with whether the person still had any teeth the extraction of which had been recommended by a doctor or dentist. For various reasons, including the fact that the proportion of affirmative answers was higher for persons who had seen the dentist in the year than for those who had not, data on this point are not included in the paper. Since the data secured in this survey were largely the same, whether for the informant himself or for some other member of the family, consideration of this point is also omitted.

[8] The sample was obtained by an arbitrary division of the census enumeration districts into units having about the same population, every nineteenth unit being completely enumerated.

[9] This figure may be compared with that of 24 percent in the survey in 1928–31 of the Committee on the Costs of Medical Care (also 3 years of age and over). See "The Incidence of Illness and the Receipt and Cost of Medical Care Among Representative Families: Experiences in Twelve Consecutive Months During 1928–31" by I. S. Falk, Margaret C. Klem, and Nathan Sinai. Publication No. 26 of the Committee on the Costs of Medical Care. 1933.

The estimates of dental care based on visits to dentists for specified treatment were much less for the Negro population in Detroit than for the white population. To avoid the confusion of combining the figures for white and colored persons, most of the following tables have been limited to white persons. Certain comparisons by color will be made later in this paper.

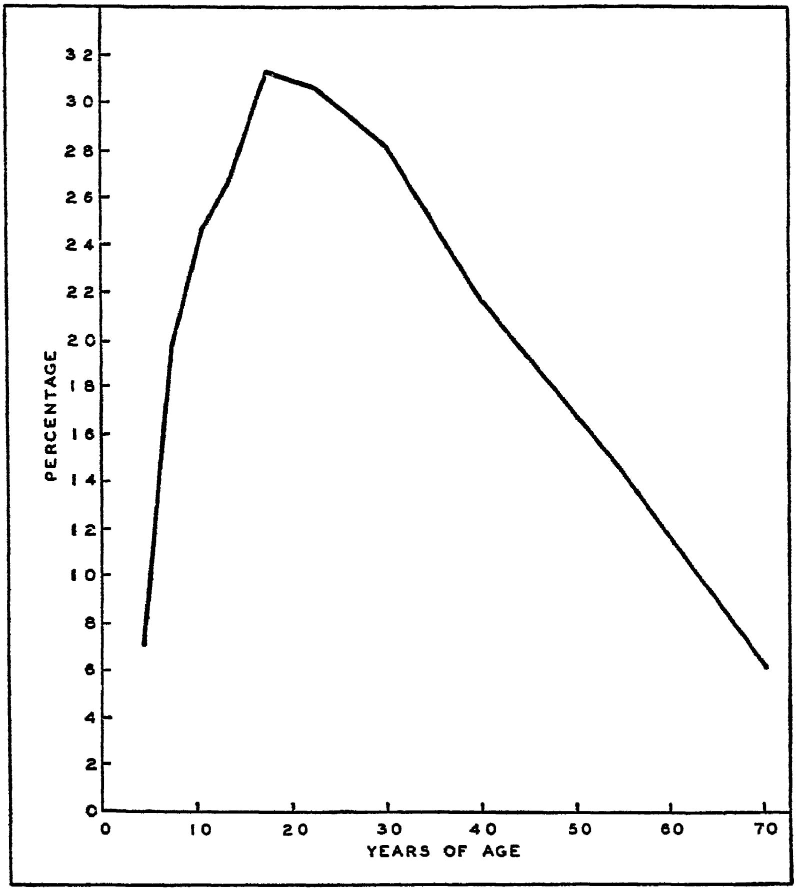

FIGURE 1.—Percentage of white persons of specific ages who were reported to have received dental care (exclusive of extractions only) during the study year.

As would be expected, the percentage of persons reporting visits to dentists during a year varies greatly with their age. Among white persons from 3 to 5 years of age, only 7 percent were reported as having seen a dentist during the year (excluding visits for extractions only). This percentage rose to a maximum of 31 in the age group 15–19 and gradually decreased during adult life, so that for persons over 65 years of age the percentage was only 6. The curve by age is shown in figure 1. (Data in Appendix, table A.) The comparison suggests that visits to dentists may be related to urgency associated with dental disease, since visits increase up to adult life. It is believed that this is also true of attack by dental caries. Data secured in this survey were not of a character to explain the rapid decline in adult life.

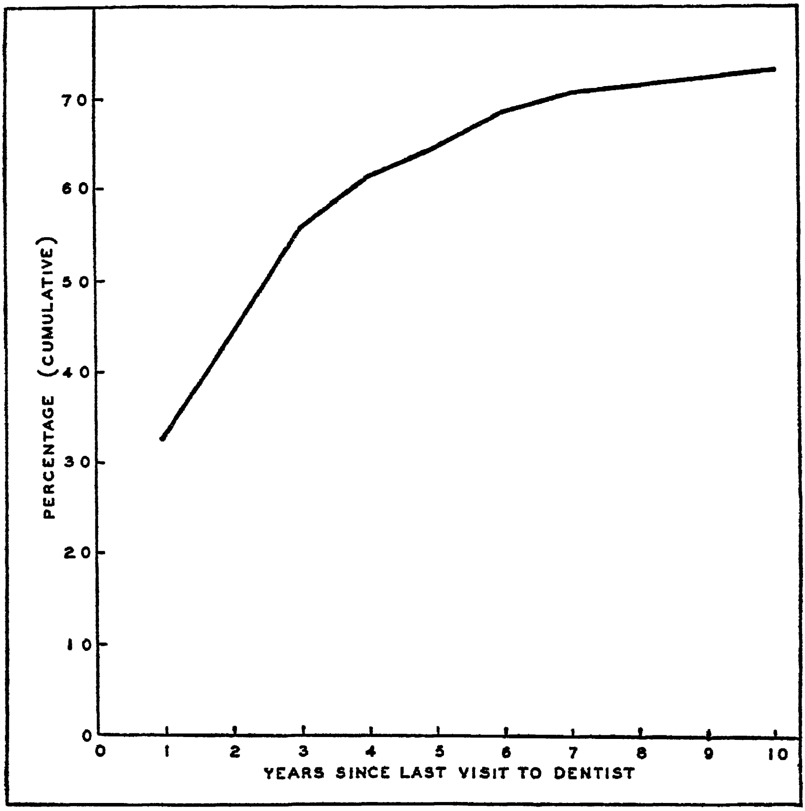

FIGURE 2.—Percentage of white persons (3 years of age and over) by time since last reported visit to the dentist.

The information received in the survey was not entirely limited to the experience of the year prior to the date of the visit, as one of the questions asked was how long since a person had been to the dentist. For periods of more than a year, however, it was not possible to exclude visits for extractions only. Figure 2 gives the cumulative percentage of white persons 3 years of age and older against the time since the last reported visit to the dentist. (Data in Appendix, table B.) It will be observed from the table that about 65 percent were reported to have been to the dentist within 5 years and about 19 percent as never having been to the dentist.

It is obvious that the proportion of persons who were reported as never having been to a dentist will be especially affected by the factor of age. In table 1, accordingly, this percentage is given for specific age groups. It varies from a maximum of 85 percent for persons in the age group 3–5 years to a minimum of 8 percent for persons in the age group 25–34 years. The slight increase in the percentages for persons of more advanced age is probably due partly to the question of memory and partly to an increased amount of dental care at the present time.

TABLE 1.—*Percentage of white persons who were reported as never having been to a dentist, by age*

Age group	Percentage	Number who had never been to dentist	Population surveyed
Total[1]	18.5	12,280	66,463
3-5	85.0	3,113	3,663
6-8	46.4	1,751	3,772
9-11	26.7	1,047	3,925
12-14	22.7	920	4,059
15-19	16.6	1,041	6,278
20-24	11.6	694	5,974
25-34	8.2	977	11,934
35-44	8.9	1,107	12,439
45-64	10.7	1,262	11,775
65+	12.4	295	2,370

[1] 3 years and older; includes unknown age.

Occupations of the household head were grouped on the basis of socio-economic class as follows: (*a*) Professional persons; (*b*) Wholesale and retail dealers, other proprietors, managers and officials; (*c*) Clerks, salesmen and kindred workers; (*d*) Skilled workmen and foremen; (*e*) Semi-skilled workers; (*f*) Unskilled workers; (*g*) Servant class.

Table 2 shows for each of these socio-economic classes, the percentage of white persons, 3 years of age and over, who were reported to have received dental care (exclusive of extractions only) during the period of 1 year prior to the date of the visit. Whereas the percentage in families of which the head was a professional person is 42, it falls as low as 16 for families of which the head was an unskilled worker.

TABLE 2.—*Percentage of white persons (3 years and older) reported to have received dental care (exclusive of extractions only) during the study year, by socio-economic class of household head*

Socio-economic class of household head	Percent	Persons receiving care	Population surveyed
Professional persons	42.5	1,158	2,726
Dealers, etc	30.0	2,123	7,069
Clerks, etc	30.6	2,682	8,757
Skilled workmen and foremen	20.8	3,676	17,698
Semiskilled workers	17.2	3,313	19,245
Unskilled workers	16.3	1,416	8,690
Servants	18.3	313	1,714

The Fundamentals study of the Committee on the Costs of Medical Care [10] concluded that all persons 3 years of age and over should receive some dental care every year. Exclusive of cases where the only visit was for extractions, that was true of 42 percent of persons in families in which the household head was a professional person; inclusive of cases where the only care was for extractions, the percentage was 51.

The survey followed a period of intense depression during which dental care was probably neglected in a large part of the population. At the time of the canvass the degree of recovery in Detroit would lead one to expect that many persons would be making long postponed calls to dentists. It is reasonable to assume, therefore, that the figures shown in this analysis, especially for certain groups of the population, are somewhat in excess of what would be found during a normal period. For this reason the differences for families on various socio-economic levels may not be as great as they would be in a normal period.

The ratio of the percentage of persons receiving dental care in different socio-economic groups to that for professional persons is not uniform at different ages. The percentages and the ratio for the different age groups are therefore shown in the Appendix, table C. In order to have sufficient numbers to furnish reliable results, certain of the socio-economic groups have been combined. It is evident that the relative lack of dental care in the semiskilled and unskilled groups is very much greater for children than it is for young adults. There is also a tendency for an increasing difference in late adult life.

Table 3, giving the proportion of adults reported as never having been to a dentist, by socio-economic class of the household head, shows a very great contrast between the professional and other groups, the proportion being four times as great for the unskilled as for the professional.

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[10] The Fundamentals of Good Medical Care: An Outline of the Fundamentals of Good Medical Care and an Estimate of the Service Required to Supply the Medical Needs of the United States. By Roger I. Lee and Lewis Webster Jones. Publication No. 22 of the Committee on the Costs of Medical Care. 1933.

TABLE 3.—*Percentage of white persons (20 years and older) who were reported as never having been to a dentist, by socio-economic class of household head*

Socio-economic class of household head	Percent	Number who never had been to dentist	Population surveyed
Professional persons	4 4	87	1, 966
Dealers, etc	7.2	349	4, 842
Clerks, etc	6 2	384	6, 192
Skilled workmen	9. 5	1, 090	11, 506
Semi-skilled workers	10 5	1, 323	12, 594
Unskilled workers	16. 3	946	5, 787
Servants	10. 5	128	1, 222

The colored population may perhaps most easily be regarded as forming an additional socio-economic class. In table 4, therefore, the percentage of persons reported to have received dental care (exclusive of extractions only) during the year preceding the date of the visit, is shown for the professional white group, for the total white group, and for the colored. The very great contrast between the white and colored population is evident. Five times as many individuals in households of professional persons (white) were reported to have received dental care (exclusive of extractions) as in the colored population.[11]

TABLE 4.—*Percentage of persons reported to have received dental care (exclusive of extractions only) during the study year, by color, in 2 broad age groups*

	Total[1]	3 to 19 years	20 years and older
Percent:			
White:			
Professional	42. 5	44. 7	41. 8
Total	22. 3	23. 2	21. 9
Colored	8. 4	10. 2	7. 5
Persons receiving care:			
White			
Professional	1, 158	335	822
Total	14, 808	5, 031	9, 731
Colored	343	135	206
Population surveyed:			
White			
Professional	2, 726	750	1, 966
Total	66, 463	21, 727	44, 402
Colored	4, 091	1, 319	2, 738

[1] 3 years and older; includes unknown age.

Up to this point the percentages have not been given separately for the two sexes. The differences are not sufficiently great to affect any of the comparisons which have been made, but it is of interest to note that a slightly higher proportion of women appears to have received dental care, which may be associated with greater need. (See Appendix, table D.)

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[11] In this comparison no allowance can be made for possible differences in the need for dental care among white and colored persons. In view of the fact that the incidence of dental caries is known to be lower in the colored race it is clear that the need for that part of dental care associated with dental caries must be lower for colored.

It has been brought out that 33 percent of white persons were reported to have received dental care during the year before the date of the visit. Eleven percent of these persons made their visits for extractions only, 11 percent for fillings only, and 4 percent for fillings and extractions. Table 5 indicates the percentage of persons reported to have made visits for different types of treatment.[12] Various combinations are shown and also the percentage of persons who made visits for any one kind of treatment, regardless of whether they also made visits for some other kind of treatment.

TABLE 5.—*Percentage of white persons (3 years and older) who were reported to have received dental care during the study year, by type of treatment*

Type of treatment	Percent	Number
Any care	32.7	21,784
Filling only	11.2	7,456
Filling, replacement, and extraction	.5	331
Filling and extraction	4.1	2,727
Replacement only	1.1	733
Replacement and extraction	.9	606
Treatment of gums only	.6	397
Extraction only	10.5	6,976
Other combinations of above	1.4	916
Totals:		
Filling	16.9	11,242
Replacement	3.3	2,163
Extraction	16.7	11,103
Treatment of gums	1.6	1,081
Other treatment	.1	74
Unknown as to nature	2.0	1,312
Any, exclusive of extractions only	22.3	14,808
Persons surveyed		66,463

The nature of the dental care received in different age groups is shown in figure 3 (Appendix, table E). It will be noted that considerable difference exists in the relative incidence of the various types of treatment at different ages.

There is a marked difference by socio-economic class with respect to fillings and treatment of the gums and to a lesser extent in the case of replacement. For extractions, however, there is, if anything, a tendency for higher percentages in the lower socio-economic groups.[13] Where this tendency is real it would indicate the substitution of extractions for fillings. Table F, in the Appendix, gives the percentages reporting dental care and the ratio to the percentages for the professional group in four different age periods.

A similar comparison is made for the colored population in the Appendix, table G, which reveals very wide differences. White persons in the professional group showed a percentage about eight times as great as that for colored persons in the case of fillings, and large differences also for other types of treatment except extractions.

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[12] The fact that only 2.0 percent were recorded as having been to a dentist, with no information as to the nature of the treatment, makes us feel an additional confidence in the data covering the percentage of persons who were reported as having seen the dentist within 1 year.

[13] This is in agreement with findings based on further analysis of the data obtained in the survey reported in Public Health Bulletin No. 226 (Dental Survey of School Children, ages 6 to 14 years, made in 1933–34 in 26 States).

SUMMARY

As a part of the National Health Inventory, a supplementary schedule was utilized in one city (Detroit, Mich.) to determine the amount and kind of dental care received by a representative sample

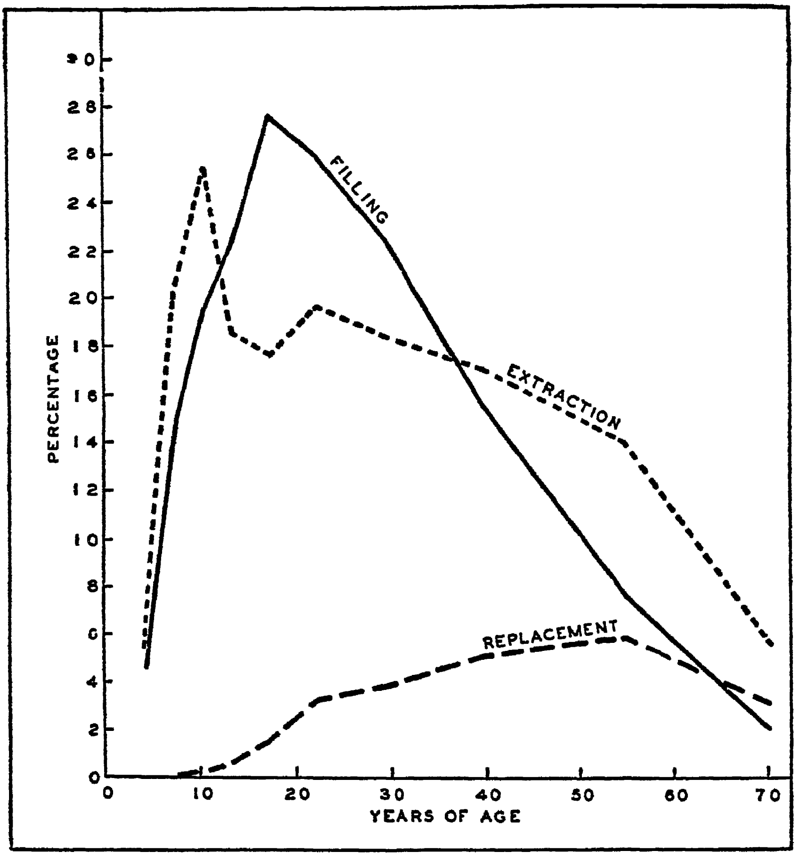

FIGURE 3.—Percentage of white persons of specific ages who were reported to have received dental care of certain kinds during the study year.

of the population (70,554 persons 3 years of age and over being surveyed). Information was secured by house-to-house canvass as to when the person had last seen a dentist and the type of treatment received in the year before the date of the canvass. Visits for cleaning of teeth only were excluded. The items were related to the age and sex of the persons, and the color and socio-economic class of the household head. The following facts stood out (they are based on white persons 3 years of age and over except where otherwise specified):

1. Thirty-three percent (22 percent if visits for extractions only are excluded) were reported to have seen the dentist in the year before the date of the canvass.

2. The differences with age were marked, varying from 7 percent (excluding visits for extraction only) in the age group 3 to 5 years, to 31 percent in the age group 15 to 19 years, and down to 6 percent in the age group 65 years and over.

3. The proportion who had never seen a dentist varied from 85 percent in the age group 3 to 5 years to 8 percent in the age group 25 to 34 years, being 19 percent for the whole group.

4. The percentage of persons reported as having seen a dentist in the year before the date of the canvass (exclusive of visits for extractions only) varied greatly with socio-economic class of the household head—from 42 percent for professional to 16 percent for unskilled workers. For colored persons the figure was 8 percent.

5. The dental care received during the year before the date of the canvass was largely for extraction and/or filling, with characteristic differences by age.

6. Extractions showed slightly higher percentages in the lower socio-economic groups. All other types of treatment showed the reverse, especially fillings (about three times as much in professional as in unskilled). An even greater difference showed up in comparing persons in white professional families with the colored population.

Appendix

TABLE A.—*Percentage of white persons reported to have received dental care (exclusive of extractions only) during the study year, by age*

Age group	Percent	Persons receiving care	Population surveyed
Total [1]	22.3	14,808	66,463
3-5	7.1	260	3,663
6-8	19.7	742	3,772
9-11	24.6	966	3,925
12-14	26.6	1,087	4,069
15-19	31.5	1,976	6,278
20-24	30.7	1,832	5,974
25-34	28.2	3,369	11,934
35-44	21.6	2,685	12,439
45-64	14.4	1,699	11,775
65+	6.2	146	2,370

[1] 3 years and older; includes unknown age.

TABLE B.—*Percentage of white persons (3 years and older), by time since last reported visit to the dentist*

Time since last visit to dentist	Percent		Number
	Simple	Cumulative	
Less than 1 year	32.8	32.8	21,784
Excluding extractions only	(22.3)	----------	(14,808)
1 year	11.1	43.9	7,394
2 years	12.0	55.9	7,993
3 years	5.6	61.5	3,694
4 years	3.2	64.7	2,122
5 years	3.9	68.6	2,616
6 years	1.9	70.5	1,268
7-9 years	2.7	73.2	1,819
10 years and over	6.2	79.4	4,107
Never been to dentist	18.5	----------	12,280
Total persons surveyed[1]	----------	----------	66,463

[1] Includes unknown as to whether a dentist was ever seen and unknown time since last visit to dentist.

TABLE C.—*Percentage of white persons reported to have received dental care (exclusive of extractions only) during the study year, by socio-economic class of household head and by age*

Socio-economic class of household head	Total	Age group									
		3-5	6-8	9-11	12-14	15-19	20-24	25-34	35-44	45-64	65+
Ratio to professional:											
Professional persons	100	100	[1] 100	[1] 100	[1] 100	[1] 100	[1] 100	[1] 100	100	100	100
Dealers and clerks	72	69	61	68	74	81	78	77	71	64	67
Skilled workmen and foremen	49	40	42	50	52	60	59	53	47	35	32
Semi- and unskilled workers and servants	40	22	28	34	39	52	52	46	34	30	40
Percent:											
Professional persons	42.5	17.2	51.4	51.1	48.2	55.9	45.9	53.0	42.9	33.7	13.0
Dealers and clerks	30.4	11.9	28.2	34.4	37.7	41.3	39.3	37.1	30.5	21.5	8.7
Skilled workmen and foremen	20.8	6.8	19.4	25.2	26.7	30.5	30.0	25.4	20.0	11.9	4.2
Semi- and unskilled workers and servants	17.0	3.8	12.8	17.4	19.9	26.4	26.3	22.1	14.6	10.0	5.2
Persons receiving care:											
Professional persons	1,158	27	72	71	65	100	94	287	258	167	16
Dealers and clerks	4,805	105	241	292	323	528	498	1,155	959	636	48
Skilled workmen and foremen	3,676	64	210	288	314	539	419	718	714	377	23
Semi- and unskilled workers and servants	5,042	63	214	308	375	785	799	1,185	735	508	57
Population surveyed:											
Professional persons	2,726	157	140	139	135	179	205	541	602	495	123
Dealers and clerks	15,826	880	855	850	858	1,278	1,267	3,112	3,145	2,956	554
Skilled workmen and foremen	17,698	944	1,081	1,143	1,177	1,770	1,396	2,825	3,569	3,163	553
Semi- and unskilled workers and servants	29,649	1,665	1,672	1,768	1,887	2,974	3,041	5,364	5,037	5,062	1,099

[1] Ratios based on smoothed values for the percentage of professional persons receiving care.

TABLE D.—*Percentage of white persons reported to have received dental care (exclusive of extractions only) during study year, by sex, in two broad age groups*

	Total [1]	3 to 19 years	20 years and older
Percentage:			
Male	20.0	21.8	19.5
Female	24.7	25.2	21.4
Persons receiving care:			
Male	6,707	2,304	4,398
Female	7,949	2,681	5,260
Population surveyed:			
Male	33,474	10,843	22,577
Female	32,254	10,605	21,560

[1] 3 years and older; includes unknown age.

TABLE E.—*Percentage of white persons reported to have received dental care during the study year, by type of treatment and by age*

Age group (years)	Any care [1]	Extractions only	Extractions, total	Filling	Replacement	Treatment gums	Other and unknown	Persons
	Percent							
3-5	7.1	4.6	5.4	4.6	----------	0.8	1.7	----------
6-8	19.7	16.4	20.5	15.1	----------	1.0	3.8	----------
9-11	24.6	18.2	25.5	19.7	0.3	1.4	3.9	----------
12-14	26.6	12.2	18.5	22.2	.5	1.2	3.5	----------
15-19	31.5	9.4	17.6	27.7	1.5	1.6	2.5	----------
20-24	30.7	10.3	19.6	25.9	3.2	2.1	2.4	----------
25-34	28.2	10.6	18.3	22.3	3.9	2.1	2.8	----------
35-44	21.6	10.8	17.0	15.8	5.0	1.8	2.1	----------
45-64	14.4	8.8	13.9	7.5	5.7	1.5	1.5	----------
65+	6.2	4.0	5.5	2.0	3.0	.6	.9	----------
	Number							
3-5	260	170	197	170	----------	28	64	3,663
6-8	742	618	773	569	----------	39	144	3,772
9-11	966	714	1,000	772	11	56	153	3,925
12-14	1,087	498	758	907	19	50	143	4,089
15-19	1,976	593	1,105	1,739	95	103	160	6,278
20-24	1,832	617	1,172	1,547	194	123	142	5,974
25-34	3,369	1,268	2,180	2,666	463	256	334	11,934
35-44	2,683	1,346	2,119	1,907	623	228	258	12,439
45-64	1,699	1,038	1,633	883	669	181	173	11,775
65+	146	94	130	48	72	15	22	2,370

[1] Excluding extractions only.

TABLE F.—*Percentage of white persons reported to have received dental care during the study year, by type of treatment and by socio-economic class of household head, in 4 age groups (6 to 64 years)*

Age group and socio-economic class of household head	Ratio to professional				Percentage				Number				Population surveyed
	Extraction only	Filling	Replacement	Treatment, gums	Extraction only	Filling	Replacement	Treatment, gums	Extraction only	Filling	Replacement	Treatment, gums	
6 to 14 years													
Professional persons	100	100	100	100	12.6	38.6	0.48	4.11	52	160	2	17	414
Dealers, etc	129	65	19	23	16.3	25.2	.09	.94	191	295	1	11	1,169
Clerks, etc	107	75	43	26	13.5	29.1	.22	1.08	188	405	3	15	1,394
Skilled workmen	125	51	73	36	15.7	19.5	.35	1.50	534	662	12	51	3,401
Semiskilled workers	131	37	58	18	16.5	14.2	.28	.76	586	504	10	27	3,549
Unskilled workers	117	30	94	20	14.7	11.6	.45	.84	226	179	7	13	1,542
Servants	128	28	88	21	16.1	11.0	.42	.85	38	26	1	2	236
15 to 24 years													
Professional persons	100	100	100	100	7.0	42.2	2.86	3.39	27	162	11	13	384
Dealers, etc	120	83	95	71	8.4	35.2	2.72	2.40	103	432	34	30	1,218
Clerks, etc	140	81	73	55	9.8	34.2	2.05	1.85	127	444	27	24	1,297
Skilled workmen	137	62	76	52	9.6	26.3	2.18	1.77	304	834	69	56	3,166
Semiskilled workers	160	54	91	53	11.2	22.6	2.59	1.80	412	828	95	66	3,666
Unskilled workers	134	50	72	39	9.4	21.3	2.06	1.31	186	424	41	26	1,957
Servants	130	66	87	65	9.1	27.9	2.49	2.21	33	101	9	8	362
25 to 44 years													
Professional persons	100	100	100	100	8.0	37.7	6.1	3.50	92	431	70	40	1,143
Dealers, etc	119	65	97	69	9.5	24.4	5.9	2.42	238	614	148	61	2,518
Clerks, etc	118	71	85	79	9.4	26.9	5.2	2.75	352	1,006	195	103	3,739
Skilled workmen	141	45	72	50	11.3	16.8	4.43	1.75	724	1,073	283	112	6,394
Semiskilled workers	150	35	58	43	12.0	13.3	3.55	1.52	888	983	262	112	7,373
Unskilled workers	121	37	61	49	9.7	14.0	3.76	1.70	240	346	93	42	2,476
Servants	139	38	77	47	11.1	14.5	4.71	1.63	61	80	26	9	552
45 to 64 years													
Professional persons	100	100	100	100	8.1	18.6	10.1	3.64	40	92	50	18	495
Dealers, etc	111	61	76	53	9.0	11.3	7.7	1.93	130	164	112	28	1,450
Clerks, etc	104	71	68	53	8.4	13.1	6.8	1.93	127	198	103	29	1,506
Skilled workmen	114	32	51	34	9.2	6.0	5.2	1.23	291	191	166	39	3,163
Semiskilled workers	116	26	45	32	9.4	4.79	4.55	1.15	270	137	130	33	2,859
Unskilled workers	94	22	44	35	7.6	4.15	4.48	1.29	136	74	80	23	1,785
Servants	115	26	57	66	9.3	4.78	5.7	2.39	39	20	24	10	418

TABLE G.—*Percentage of persons reported to have received dental care during the study year, by type of treatment and by color, in 2 broad age groups*

	Type of treatment						
	Extractions, total	Extractions only	Filling	Replacement	Treatment, gums	Other and unknown	Total number of persons
Total:[1]							
Percent:							
White:							
Professional	15.7	8.2	31.9	5.1	3.67	4.37	----------
Total	16.7	10.5	16.9	3.25	1.63	2.13	----------
Colored	13.0	11.0	3.91	1.56	1.12	1.46	----------
Number receiving care:							
White:							
Professional	428	224	869	140	100	119	2,728
Total	11,103	6,976	11,242	2,163	1,081	1,416	66,463
Colored	533	448	160	64	46	60	4,691
3-19 years:							
Percent:							
White:							
Professional	14.9	8.5	35.1	0.53	4.53	4.40	----------
Total	17.6	11.9	19.1	0.63	1.27	2.55	----------
Colored	8.0	7.0	4.32	0.08	1.14	2.66	----------
Number receiving care:							
White:							
Professional	112	64	263	4	34	33	750
Total	3,833	2,593	4,157	136	276	554	21,727
Colored	106	92	57	1	15	35	1,319
20 years and older:							
Percent:							
White:							
Professional	16.0	8.0	30.8	6.9	3.36	4.37	----------
Total	16.3	9.8	15.8	4.54	1.80	1.92	----------
Colored	15.5	12.9	3.73	2.30	1.13	.86	----------
Number receiving care:							
White:							
Professional	314	158	605	136	66	86	1,966
Total	7,234	4,363	7,051	2,021	803	853	44,492
Colored	424	353	102	63	31	24	2,738

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[1] 3 years and older.

DEATHS DURING WEEK ENDED MARCH 5, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Mar. 5, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	8,753	9,612
Average for 3 prior years	9,998	--------------
Total deaths, first 9 weeks of year	80,488	95,158
Deaths under 1 year of age	534	620
Average for 3 prior years	639	--------------
Deaths under 1 year of age, first 9 weeks of year	4,835	5,801
Data from industrial insurance companies:		
Policies in force	69,774,021	69,355,137
Number of death claims	14,031	16,894
Death claims per 1,000 policies in force, annual rate	10.5	12.7
Death claims per 1,000 policies, first 9 weeks of year, annual rate	10.1	11.6

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (....) indicate that cases or deaths may have occurred although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended March 12, 1938 and March 13, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Mar. 12, 1938	Week ended Mar. 13, 1937	Week ended Mar. 12, 1938	Week ended Mar. 13, 1937	Week ended Mar. 12, 1938	Week ended Mar. 13, 1937	Week ended Mar. 12, 1938	Week ended Mar. 13, 1937
New England States:								
Maine	7	0	8	116	147	15	0	0
New Hampshire	0	0	-------	-------	26	11	0	0
Vermont	0	0	-------	-------	279	1	0	0
Massachusetts	6	0	-------	-------	200	810	1	5
Rhode Island	1	1	-------	-------	2	273	1	1
Connecticut	7	2	9	42	29	625	0	0
Middle Atlantic States:								
New York	33	44	[1] 10	[1] 47	1,881	577	11	11
New Jersey	21	10	25	39	1,136	2,015	3	1
Pennsylvania	46	47	-------	-------	7,082	299	5	6
East North Central States:								
Ohio	21	17	-------	147	2,984	137	4	14
Indiana	23	15	17	91	906	10	0	4
Illinois	37	30	19	75	6,451	49	4	5
Michigan [3]	12	14	1	3	4,449	64	1	2
Wisconsin	4	3	53	91	4,970	22	0	2
West North Central States:								
Minnesota	0	16	6	2	68	38	0	1
Iowa	4	4	17	4	163	4	2	1
Missouri	26	18	109	195	985	13	3	3
North Dakota	4	4	2	4	9	3	0	0
South Dakota	0	2	1	-------	-------	4	0	0
Nebraska	4	3	21	23	12	8	4	1
Kansas	4	13	3	43	417	10	0	2
South Atlantic States:								
Delaware	0	0	-------	1	28	99	0	1
Maryland [3]	5	7	21	64	85	659	1	5
District of Columbia	9	7	-------	14	12	106	0	3
Virginia	10	12	-------	-------	401	241	2	11
West Virginia	8	6	35	353	357	7	5	6
North Carolina	22	18	7	278	2,904	120	1	7
South Carolina	4	7	338	1,602	454	44	2	2
Georgia [3]	9	13	-------	1,125	420	-------	1	2
Florida	14	7	2	20	1,313	3	0	3
East South Central States:								
Kentucky	8	14	24	179	576	81	6	25
Tennessee	11	3	59	452	513	8	3	4
Alabama	11	9	214	2,019	1,103	33	8	20
Mississippi [3]	5	0	-------	-------	-------	-------	1	5

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended March 12, 1938 and March 13, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Mar. 12, 1938	Week ended Mar. 13, 1937	Week ended Mar. 12, 1938	Week ended Mar. 13, 1937	Week ended Mar. 12, 1938	Week ended Mar. 13, 1937	Week ended Mar. 12, 1938	Week ended Mar. 13, 1937
West South Central States:								
Arkansas	11	2	174	260	501	-------	1	20
Louisiana	9	10	8	366	11	7	4	1
Oklahoma [4]	15	5	133	337	83	25	1	10
Texas [3]	44	54	726	2, 099	309	420	5	10
Mountain States:								
Montana	2	2	-------	27	80	46	0	0
Idaho	1	1	17	5	1	29	0	0
Wyoming	0	0	-------	-------	32	4	1	0
Colorado	15	2	-------	-------	570	6	0	2
New Mexico	2	3	4	81	89	100	0	0
Arizona	0	2	99	73	42	181	0	0
Utah [2]	0	0	-------	-------	273	23	0	0
Pacific States:								
Washington	0	3	2	2	8	29	1	2
Oregon	0	0	57	34	16	7	0	1
California	39	14	54	818	348	96	3	11
Total	524	450	2, 278	11, 131	43, 802	7, 342	85	210
First 10 weeks of year	6, 327	5, 506	29, 694	235, 680	2[illegible]6, 089	52, 676	943	1, 628

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Mar. 12 1938	Week ended Mar. 13 1937	Week ended Mar. 12 1938	Week ended Mar. 13 1937	Week ended Mar. 12 1938	Week ended Mar. 13 1937	Week ended Mar. 12 1938	Week ended Mar. 13 1937	Week ended Mar. 12 1938
New England States:									
Maine	0	0	17	17	0	0	0	0	54
New Hampshire	0	0	18	19	0	0	0	1	7
Vermont	2	0	19	6	0	0	0	0	19
Massachusetts	0	0	407	256	0	0	0	2	120
Rhode Island	0	0	24	54	0	0	0	0	29
Connecticut	0	0	107	112	0	0	0	1	76
Middle Atlantic States:									
New York	2	0	937	1, 020	0	0	4	6	451
New Jersey	1	0	148	232	0	0	3	2	219
Pennsylvania	0	0	759	749	0	0	7	6	309
East North Central States:									
Ohio	0	0	471	370	10	2	6	8	188
Indiana	0	0	155	238	28	0	0	0	23
Illinois	2	2	714	888	45	24	5	6	122
Michigan [2]	0	0	794	1, 004	6	1	12	2	254
Wisconsin	0	0	182	379	3	14	0	2	108
West North Central States:									
Minnesota	0	0	153	161	10	7	0	1	18
Iowa	0	1	286	370	42	38	1	1	25
Missouri	0	0	230	269	50	70	3	6	60
North Dakota	0	0	14	58	9	3	0	0	20
South Dakota	0	0	45	87	12	2	0	0	34
Nebraska	0	0	69	57	10	9	0	0	9
Kansas	0	0	207	492	20	32	0	2	116
South Atlantic States:									
Delaware	0	0	13	10	0	0	0	0	1
Maryland [3]	0	0	74	31	0	0	0	2	45
District of Columbia	0	0	24	9	0	0	0	0	5
Virginia	0	0	36	31	0	0	2	3	122
West Virginia	0	0	64	42	0	0	3	3	54
North Carolina	4	1	27	28	1	0	3	0	412
South Carolina	0	0	3	11	0	0	0	8	56
Georgia [3]	3	0	8	22	2	0	0	8	56
Florida	0	0	9	8	0	0	3	5	10

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended March 12, 1938 and March 13, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Mar. 12 1938	Week ended Mar. 13 1937	Week ended Mar. 12 1938	Week ended Mar 13 1937	Week ended Mar. 12 1938	Week ended Mar. 13 1937	Week ended Mar. 12 1938	Week ended Mar. 13 1937	Week ended Mar. 12 1938
East South Central States:									
Kentucky	2	1	114	46	7	0	0	5	50
Tennessee	0	0	28	18	14	0	2	3	28
Alabama	1	2	17	17	0	0	3	3	32
Mississippi [2]	1	5	1	13	1	0	1	0	-------
West South Central States:									
Arkansas	0	1	5	12	9	5	6	2	31
Louisiana	1	0	19	9	2	0	21	13	18
Oklahoma [4]	0	0	35	34	16	3	1	4	43
Texas [3]	2	2	139	112	28	1	10	9	355
Mountain States:									
Montana	0	0	46	36	7	18	0	0	16
Idaho	1	0	16	19	10	1	2	0	13
Wyoming	0	0	14	19	0	2	0	0	45
Colorado	0	0	45	42	3	0	0	0	9
New Mexico	0	0	16	30	1	0	0	0	81
Arizona	0	0	9	4	2	0	0	0	42
Utah [2]	0	0	57	16	1	0	0	0	30
Pacific States:									
Washington	0	0	55	29	81	6	2	5	179
Oregon	1	0	35	24	46	26	2	3	15
California	1	1	235	234	24	11	4	4	529
Total	24	19	6,900	7,739	300	285	109	116	4,542
First 10 weeks of year	216	211	61,200	65,463	5,084	2,942	1,173	1,101	40,631

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[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Mar. 12, 1938, 10 cases as follows Georgia, 5; Texas, 5.
[4] Figures for 1937 are exclusive of Oklahoma City and Tulsa

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
February 1938										
California	11	134	404	1	1,174	5	11	870	164	26
District of Columbia	2	59	3	--------	34	1	1	76	0	2
Florida	7	55	20	37	1,663	3	3	55	1	8
Iowa	7	22	49	--------	264	--------	0	998	171	5
Maine	1	3	33	--------	431	--------	1	62	0	3
Nebraska	2	41	23	--------	66	--------	1	274	37	1
New Jersey	8	85	72	--------	5,372	--------	1	509	0	4
Vermont	0	2	4	--------	858	--------	0	68	0	2
West Virginia	19	34	247	--------	1,684	--------	3	229	0	24
Wyoming	1	4	1	--------	25	--------	0	64	10	0

Summary of monthly reports from States—Continued

February 1938	Cases
Chickenpox:	
California	3,104
District of Columbia	289
Florida	187
Iowa	852
Maine	240
Nebraska	215
New Jersey	3,228
Vermont	199
West Virginia	252
Wyoming	87
Dysentery:	
California (amoebic)	6
California (bacillary)	13
District of Columbia (amoebic)	1
Florida (amoebic)	1
Maine (bacillary)	3
New Jersey (amoebic)	1
Encephalitis, epidemic or lethargic:	
California	2
Florida	1
Food poisoning:	
California	73
German measles:	
California	74
Florida	3
Iowa	8
Maine	21
New Jersey	68
Vermont	13
Granuloma, coccidioidal:	
California	5

February 1938—Continued	Cases
Hookworm disease:	
Florida	780
Jaundice, epidemic:	
California	10
Leprosy:	
California	2
Mumps:	
California	1,666
Florida	68
Iowa	56
Maine	74
Nebraska	115
New Jersey	896
Vermont	530
West Virginia	28
Wyoming	48
Ophthalmia neonatorum:	
Florida	1
New Jersey	17
Paratyphoid fever:	
California	2
Florida	2
New Jersey	1
Rabies in animals:	
California	140
Florida	2
New Jersey	5
West Virginia	6
Septic sore throat:	
California	8
Iowa	9
Maine	1
New Jersey	17
West Virginia	1
Wyoming	1

February 1938—Continued	Cases
Tetanus:	
California	1
Florida	1
Trachoma:	
California	24
Trichinosis:	
California	5
Florida	1
New Jersey	1
Tularaemia:	
Iowa	1
New Jersey	1
Typhus fever:	
Florida	10
Undulant fever:	
California	10
Florida	2
Iowa	10
New Jersey	6
Vermont	4
Vincent's infection:	
Florida	68
Maine	5
Whooping cough:	
California	1,423
District of Columbia	37
Florida	84
Iowa	117
Maine	219
Nebraska	39
New Jersey	703
Vermont	109
West Virginia	279
Wyoming	65

PLAGUE INFECTION IN SANTA CRUZ COUNTY, CALIF., AND ADAMS COUNTY, WASH.

Under date of March 10, 1938, Dr. W. M. Dickie, Director of Public Health of California, reported that plague infection had been proved, by culture and animal inoculation, in 41 fleas taken on February 3 from 2 *beecheyi* squirrels from a ranch 4 miles northeast of Watsonville, Santa Cruz County, Calif.

Under date of March 15, 1938, Senior Surgeon E. R. Eskey, in charge of plague suppressive measures at San Francisco, Calif., reported that plague infection had been proved, by culture and animal inoculation, in tissue from 1 *Citellus townsendi* squirrel shot March 7, 1938, 2 miles east of Lind, Adams County, Wash.

CASES OF VENEREAL DISEASES REPORTED FOR JANUARY 1938

These reports are published monthly for the information of health officers in order to furnish current data as to the prevalence of the venereal diseases. The figures are taken from reports received from State and city health officers. They are preliminary and are therefore subject to correction. It is hoped that the publication of these reports will stimulate more complete reporting of these diseases.

Reports from States

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10.000 population
Alabama [1]				
Arizona [1]				
Arkansas	725	3.35	256	1.25
California	1,557	2.53	1,341	2.18
Colorado	26	.24	16	.15
Connecticut	217	1.25	105	.60
Delaware	240	9.20	71	2.72
District of Columbia	190	3.03	141	2.25
Florida [1]				
Georgia	1,688	5.47	293	.95
Idaho	51	1.03	33	.67
Illinois	1,929	2.45	1,008	1.28
Indiana	349	1.00	79	.23
Iowa	301	1.18	162	.63
Kansas	180	.97	50	.27
Kentucky	716	2.45	315	1.08
Louisiana	563	2.67	102	.48
Maine	50	.59	59	.69
Maryland	970	5.83	259	1.54
Massachusetts	433	.98	376	.85
Michigan	926	1.92	660	1.37
Minnesota	255	.96	192	.72
Mississippi	2,085	10.31	2,377	11.75
Missouri	416	1.04	91	.23
Montana [2]	63	1.17	42	.78
Nebraska	104	.76	115	.84
Nevada [3]				
New Hampshire	24	.47	9	.18
New Jersey	820	1.59	232	.58
New Mexico	119	2.82	57	1.35
New York	4,060	3.13	2,011	1.55
North Carolina	3,240	9.28	574	1.64
North Dakota	48	.68	32	.45
Ohio	1,683	2.50	445	.66
Oklahoma [2]	490	1.92	398	1.56
Oregon	139	1.35	166	1.62
Pennsylvania	1,867	1.85	250	.25
Rhode Island	101	1.48	54	.79
South Carolina [2]	360	1.92	371	1.98
South Dakota	38	.55	18	.26
Tennessee	919	3.18	419	1.45
Texas	1,390	2.25	380	.62
Utah	29	.56	56	1.08
Vermont	22	.57	18	.47
Virginia	936	3.46	291	1.08
Washington	318	1.92	373	2.25
West Virginia [2]	371	1.90	167	.90
Wisconsin [4]	43	.15	119	.41
Wyoming [5]	7	.30	2	.09
Total	31,095	2.50	14,585	1.17

See footnotes at end of table.

Reports from cities of 200,000 population or over

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Akron, Ohio [1]	----------	----------	----------	----------
Atlanta, Ga.	325	11.32	135	4.70
Baltimore, Md.	579	7.02	163	1.98
Birmingham, Ala.	316	11.19	80	2.83
Boston, Mass.	193	2.44	142	1.80
Buffalo, N. Y.	135	2.28	70	1.18
Chicago, Ill.	1,112	3.12	658	1.84
Cincinnati, Ohio [1]	----------	----------	----------	----------
Cleveland, Ohio [1]	----------	----------	----------	----------
Columbus, Ohio	59	1.93	7	.23
Dallas, Tex.	335	11.57	68	2.35
Dayton, Ohio	64	3.04	20	.95
Denver, Colo.	33	1.11	19	.64
Detroit, Mich.	409	2.36	325	1.88
Houston, Tex. [6]	193	5.76	56	1.07
Indianapolis, Ind.	27	.72	35	.93
Jersey City, N. J.	10	.31	1	.03
Kansas City, Mo.	33	.78	2	.05
Los Angeles, Calif.	537	3.75	353	2.47
Louisville, Ky.	352	10.86	113	3.49
Memphis, Tenn.	343	12.85	98	3.67
Milwaukee, Wis. [3]	----------	----------	----------	----------
Minneapolis, Minn.	73	1.50	79	1.62
Newark, N. J. [1]	----------	----------	----------	----------
New Orleans, La. [1]	----------	----------	----------	----------
New York, N. Y.	2,545	3.48	1,547	2.12
Oakland, Calif. [1]	----------	----------	----------	----------
Omaha, Nebr.	42	1.91	42	1.91
Philadelphia, Pa.	882	2.93	----------	----------
Pittsburgh, Pa.	251	3.67	20	.29
Portland, Oreg.	9	.29	65	2.07
Providence, R. I.	65	2.51	33	1.27
Rochester, N. Y.	34	1.01	38	1.13
St. Louis, Mo.	238	2.85	115	1.38
St. Paul, Minn.	16	.57	14	.50
San Antonio, Tex. [3]	----------	----------	----------	----------
San Francisco, Calif.	167	2.49	226	3.37
Seattle, Wash.	116	3.06	133	3.50
Syracuse, N. Y.	71	3.26	39	1.79
Toledo, Ohio	178	5.85	79	2.60
Washington, D. C. [7]	190	3.03	141	2.25

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[1] No report for current month.
[2] Incomplete.
[3] No report during present fiscal year.
[4] Only cases of syphilis in the infectious stage are reported.
[5] From report submitted to medical director of epidemiological studies.
[6] Reported by Jefferson Davis Hospital.
[7] Reported by social hygiene clinic.

WEEKLY REPORTS FROM CITIES

City reports for week ended March 5, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	200	823	140	5,748	999	2,475	24	418	19	1,285	-------
Current week [1]	155	185	53	15,167	688	1,851	39	355	29	1,042	-------
Maine:											
Portland	0	------	0	6	4	1	0	0	0	28	26
New Hampshire:											
Concord	0	------	0	2	0	1	0	0	0	5	6
Manchester	0	------	0	1	2	0	0	1	0	0	24
Nashua	0	------	0	0	0	0	0	0	0	11	7
Vermont:											
Barre	0	------	0	18	0	0	0	0	0	0	2
Burlington	0	------	0	4	0	0	0	0	0	2	8
Rutland	0	------	0	0	2	0	0	0	0	0	7
Massachusetts:											
Boston	1	------	1	191	30	89	0	3	0	18	208
Fall River	0	------	0	1	2	3	0	2	0	4	39
Springfield	0	------	0	0	3	5	0	0	0	7	37
Worcester	0	------	0	0	12	28	0	2	0	6	-------
Rhode Island:											
Pawtucket	1	------	0	0	1	3	0	0	0	0	16
Providence	0	------	0	1	6	10	0	0	0	12	59
Connecticut:											
Bridgeport	0	------	0	0	4	18	0	1	0	0	37
Hartford	0	------	0	0	2	27	0	0	0	3	44
New Haven	1	------	0	0	4	0	0	1	0	8	32
New York:											
Buffalo	0	------	0	3	11	40	0	5	0	8	165
New York	39	18	6	931	143	378	0	108	2	210	1,615
Rochester	0	1	0	4	8	10	0	2	0	1	72
Syracuse	0	------	0	33	5	12	0	0	0	6	47
New Jersey:											
Camden	2	------	1	30	5	10	0	1	0	1	34
Newark	0	2	1	15	7	18	0	15	1	27	120
Trenton	0	------	1	4	10	2	0	0	0	0	42
Pennsylvania:											
Philadelphia	6	------	2	847	35	115	0	34	1	39	552
Pittsburgh	3	4	3	321	14	48	0	7	1	19	182
Reading	0	------	0	7	1	6	0	3	0	1	29
Scranton	1	------	-------	51	------	7	0	------	0	1	-------
Ohio:											
Cincinnati	1	------	0	2	14	12	0	8	0	1	127
Cleveland	4	16	0	264	15	69	1	9	0	41	191
Columbus	1	------	0	296	10	5	0	3	0	1	78
Toledo	0	------	0	150	4	8	0	4	0	5	75
Indiana:											
Anderson	0	------	0	14	0	3	3	1	0	1	14
Fort Wayne	0	------	0	37	3	14	0	1	0	0	30
Indianapolis	5	------	1	262	8	21	1	8	0	3	91
South Bend	0	------	0	8	2	1	0	0	0	1	18
Terre Haute	3	------	0	16	0	4	0	0	1	0	24
Illinois:											
Alton	0	------	0	0	3	8	0	0	0	0	11
Chicago	14	10	5	3,474	42	270	1	36	2	35	719
Elgin	0	------	0	6	0	12	0	0	0	2	11
Moline	0	------	0	64	0	15	0	0	0	2	12
Springfield	0	------	0	155	3	3	1	0	0	0	20
Michigan:											
Detroit	6	1	0	2,752	15	159	0	12	0	82	192
Flint	0	------	0	5	3	44	0	1	0	10	27
Grand Rapids	0	------	0	23	2	13	0	0	0	3	31
Wisconsin:											
Kenosha	0	------	0	12	0	2	0	2	0	2	11
Madison	0	------	0	20	2	3	0	0	0	1	16
Milwaukee	1	------	0	3,131	10	16	0	6	0	32	100
Racine	------	------	-------	-------	------	-------	-------	------	------	-------	-------
Superior	0	------	0	11	0	0	1	0	0	1	5
Minnesota:											
Duluth	0	------	1	1	2	5	0	2	0	6	20
Minneapolis	2	------	1	17	2	21	5	5	0	9	101
St. Paul	0	------	0	1	6	5	11	2	0	4	85

[1] Figures for Racine, St. Joseph, and Wilmington, N. C., estimated; reports not received.

City reports for week ended March 5, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Iowa:											
Cedar Rapids	0	------	------	1	------	3	0	------	0	1	------
Davenport	0	------	------	13	------	1	0	------	0	0	------
Des Moines	0	------	------	0	------	23	0	------	0	0	38
Sioux City	0	------	------	0	------	11	0	------	0	1	------
Waterloo	2	------	------	79	------	19	0	------	0	0	------
Missouri:											
Kansas City	0	2	0	212	13	15	0	3	0	4	105
St Joseph	------	------	------	------	------	------	------	------	------	------	------
St. Louis	7	------	1	26	6	86	2	3	1	2	191
North Dakota:											
Fargo	0	------	0	0	3	2	0	0	0	4	11
Grand Forks	0	------	------	0	------	1	1	------	0	0	------
Minot	0	------	0	0	0	0	3	0	0	2	4
South Dakota:											
Aberdeen	0	------	------	0	------	2	0	------	0	2	------
Sioux Falls	0	------	------	0	------	0	0	------	0	0	8
Nebraska:											
Lincoln	0	------	------	1	------	12	0	------	0	0	------
Omaha	5	------	0	6	7	5	0	1	0	0	50
Kansas:											
Lawrence	0	------	0	0	0	1	0	0	0	2	3
Topeka	0	------	0	27	3	2	0	0	0	18	25
Wichita	0	------	0	2	3	0	0	1	0	2	24
Delaware:											
Wilmington	1	------	0	4	4	4	0	2	0	0	36
Maryland:											
Baltimore	3	10	3	5	24	36	0	8	1	49	218
Cumberland	0	------	0	0	3	4	0	0	0	0	15
Frederick	0	------	0	0	0	0	0	0	0	0	6
District of Columbia:											
Washington	7	1	1	5	18	25	0	8	0	9	154
Virginia:											
Lynchburg	0	------	1	2	1	0	0	0	0	4	17
Norfolk	0	------	0	18	4	11	0	1	0	1	24
Richmond	1	------	0	26	5	5	0	0	0	0	63
Roanoke	1	------	0	1	2	0	0	1	0	1	13
West Virginia:											
Charleston	0	------	0	113	2	0	0	1	0	0	14
Huntington	0	------	------	5	------	0	0	------	0	0	------
Wheeling	0	------	0	64	3	7	0	1	0	1	31
North Carolina:											
Gastonia	0	------	------	14	------	0	0	------	0	8	------
Raleigh	0	------	0	46	0	0	0	0	0	11	2
Wilmington	------	------	------	------	------	------	------	------	------	------	------
Winston-Salem	1	------	0	9	3	2	0	0	0	59	17
South Carolina:											
Charleston	1	26	1	83	4	0	0	0	0	1	25
Columbia	------	------	------	------	------	------	------	------	------	------	------
Florence	0	------	0	9	1	0	0	1	0	0	13
Greenville	0	------	0	1	1	0	0	0	0	13	5
Georgia:											
Atlanta	0	16	0	200	6	3	4	4	1	1	90
Brunswick	0	------	0	0	0	0	0	0	0	0	5
Savannah	3	43	0	31	3	0	0	0	0	0	37
Florida:											
Miami	0	1	0	179	2	0	0	1	0	2	46
Tampa	4	1	1	7	2	2	0	0	0	0	29
Kentucky:											
Covington	0	------	0	7	3	2	0	1	0	0	14
Lexington	0	------	0	2	2	1	0	2	0	2	19
Louisville	0	2	0	236	7	24	0	0	0	4	84
Tennessee:											
Knoxville	1	8	3	43	1	2	0	0	0	6	32
Memphis	0	------	2	141	10	3	0	5	0	6	94
Nashville	0	0	4	141	4	0	0	2	0	8	54
Alabama:											
Birmingham	1	8	1	176	3	2	0	3	0	0	73
Mobile	0	------	2	20	5	1	0	1	0	0	33
Montgomery	0	------	------	71	------	0	0	------	0	4	------
Arkansas:											
Fort Smith	2	------	------	2	------	0	0	------	0	2	------
Little Rock	0	------	0	80	1	0	0	2	0	1	3

City reports for week ended March 5, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	------	0	1	1	1	0	0	0	0	3
New Orleans	6	4	3	2	19	6	0	10	17	12	162
Shreveport	1	------	0	0	5	4	0	1	0	0	37
Oklahoma:											
Muskogee	1	------	------	0	------	1	0	------	0	0	------
Oklahoma City	1	------	1	------	6	3	0	1	0	------	44
Tulsa	0	------	------	8	------	0	5	------	1	6	------
Texas:											
Dallas	1	2	2	0	11	14	0	3	0	0	77
Fort Worth	0	------	0	0	0	6	1	1	0	2	44
Galveston	0	------	0	0	2	1	0	2	0	0	21
Houston	5	1	1	0	7	7	0	6	0	0	83
San Antonio	1	------	2	0	9	1	0	6	0	1	75
Montana:											
Billings	1	------	1	0	1	2	0	0	0	2	8
Great Falls	0	------	0	0	2	8	1	0	0	4	10
Helena	0	------	0	0	0	1	0	0	0	2	4
Missoula	0	------	0	0	2	1	0	0	0	0	10
Idaho:											
Boise	0	------	0	0	1	1	2	0	0	0	9
Colorado:											
Colorado Springs	5	------	0	0	1	1	0	3	0	1	8
Denver	6	------	1	536	9	21	1	2	1	3	96
Pueblo	0	------	0	0	1	3	0	3	0	0	13
New Mexico:											
Albuquerque	0	------	0	4	3	4	0	4	0	2	21
Utah:											
Salt Lake City	0	------	0	209	5	13	0	1	0	3	37
Washington:											
Seattle	2	------	------	2	------	5	3	------	0	46	------
Spokane	0	------	0	0	3	2	1	0	0	6	29
Tacoma	0	------	0	0	4	8	2	1	0	5	27
Oregon:											
Portland	0	3	1	1	8	22	2	3	0	2	102
Salem	0	3	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	6	15	2	14	20	33	2	15	0	13	296
Sacramento	0	1	0	0	3	7	0	3	0	74	47
San Francisco	2	4	0	2	8	16	0	11	0	45	170

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
New York:			
Buffalo	1	1	0
New York	6	1	0
Pennsylvania:			
Pittsburgh	1	0	0
Illinois:			
Chicago	1	0	0
Minnesota:			
Minneapolis	1	0	0
Maryland:			
Baltimore	1	1	0
District of Columbia:			
Washington	2	0	0
West Virginia:			
Wheeling	1	0	0

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Georgia:			
Atlanta	1	0	0
Tennessee:			
Memphis	1	0	0
Alabama:			
Birmingham	0	2	0
Louisiana:			
New Orleans	1	1	0
Shreveport	0	1	0
California:			
Los Angeles	2	0	0
Sacramento	1	1	0

Encephalitis, epidemic or lethargic.—Cases: Buffalo, 1; New York, 1.
Pellagra.—Cases: Topeka, 1; Baltimore, 1; Atlanta, 2; Brunswick, 1; Savannah, 6; New Orleans, 1.
Undulant fever.—Cases: Davenport, 1.

FOREIGN AND INSULAR

AUSTRIA

Vital statistics—Year 1936.—The following table shows the births, deaths, and marriages in Austria for the year 1936:

Population	6,760,631
Marriages	45,996
Births	90,348
Total deaths	88,902
Deaths under 1 year of age	8,241
Deaths from:	
Accidents	2,305
Cancer and other malignant tumors	12,365
Cirrhosis of the liver	595
Diabetes	
Diarrhea (under 2 years of age)	816
Diphtheria	867
Dysentery	12
Deaths from—Continued.	
Heart disease	15,009
Homicide	146
Influenza	447
Malaria	3
Measles	100
Scarlet fever	80
Suicide	2,696
Syphilis	401
Tuberculosis (all forms)	6,776
Typhoid fever and paratyphoid fever	105
Whooping cough	263

CANADA

Provinces—Communicable diseases—2 weeks ended February 12, 1938.—During the 2 weeks ended February 12, 1938, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia[1]	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis		1	1	3	1					6
Chickenpox		13	2	254	509	99	45	38	191	1,151
Diphtheria		4	9	79	11	5	1	5	1	115
Dysentery					2					2
Erysipelas				14	8	3	3		2	30
Influenza		58			76	3			58	195
Lethargic encephalitis					1					1
Measles		111	67	263	474	139	101	149	330	1,634
Mumps		74			314	121	1	13	31	554
Paratyphoid fever		1						1	1	3
Pneumonia		25			83		1		38	147
Poliomyelitis				1		1	2	1	1	6
Scarlet fever	2	20	8	221	328	62	99	131	98	969
Smallpox							6		1	7
Tuberculosis	2	23	19	111	78	3	52	2	38	328
Typhoid fever		1	6	52	2	1		1	2	65
Undulant fever					3			1		4
Whooping cough				245	155	26		5	98	529

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[1] For 2 weeks ended Feb. 16, 1938.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following table must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths; P, present]

Place		Aug. 1-28, 1937	Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Week ended— December 1937 4	11	18	25	January 1938 1	8	15	22	29	February 1938 5	12	19	26
China:																		
Canton	C	80	102	14														
Hangchow	C		12	[1]41														
Hong Kong	C	964	580	84	7					1		1						
	D	497	344	63	7							1						
Kwangchow Wan	C	104		62	12													
	D	81		26	10													
Macao	C	286	190	27	2													
Manchuria:																		
Dairen	C			6														
Kwantung Leased Territory	C		3															
Mukden	C			2														
Nanking	C			120														
	D			14														
Shanghai	C	8	1,804	1,414	237	6	10	3	3	3								
Swatow	C	8	24	44	101	2												
Tientsin	C			8														
Chosen: Fusan	C		1															
Dutch East Indies:																		
Celebes	C		[2]6															
Macassar	C											1						
India	C	18,259	12,203	11,344	6,802	1,664	1,563	1,245	851	1,807	1,718	1,490						
	D	7,976	5,768	5,787	3,737	835	831	569	409	906	766	769						
Assam	C	35	44	59	87	6	68	40	25	35	45	88	53	41	31	41	36	29
	D	25	16	25	53	1	13	24	18	22	22	40	34	23	15	28	23	11
Bombay Presidency	C	4,273	3,366	1,375	363	49	42	53	47	7	2		1					
	D	1,719	1,571	686	171	28	19	35	35	6	1							
Bombay	C		[2]1															
Calcutta	C	77	56	83	80	19	23	15	12	6	23	21	36	33	45	60	72	19
Central Provinces and Berar	C	176	286	860	356	36	27	19	31	18	4	6	12		3	14	14	25
Chittagong	C																1	
Delhi	C				1													

Madras Presidency	C	4,210	1,844	826	1,204	374	1,020	402	858	890	910	727						
	D	1,659	771	389	431	135	480	174	389	412	338	352						
Madras	C	64	70	106	233	52	29	30	49	38	32	24	10	16	4	3	4	5
	D	26	18	43	34	12	13	8	7	6	7	3	8	5	2	2		2
Negapatam	C	1	3	1														
	D		1															
Northwest Frontier province	C	203	32	19														
Orissa Province	C	247	111	147	91	20	11	7	1	12	12	12	21	20	3	23	10	
Punjab	C	120	29															
Rangoon	C				1					1				1				
Sind State	C	1	1															
Vizagapatam	C																	1
India (French):																		
Chandernagor Territory	C			4	4	1						1	2					
Karikal Province	C		1								1							
Pondichery Province	C		1	1				1			1	1						
Indochina (French): [4]																		
Annam Province	C			37	364	40	18	31	5	5	20	12	7	19	61	151	72	51
Tonkin Province	C		320	4,179	2,342	274	69	82	84	15	26	7	2	9	12	27	2	14
Haiphong	C		56	577	44	1												
	D		30	159	27													
Hanoi	C			284	361	21	8	8	2		3							
Japan: [5]																		
Hiroshima	C		32	5														
Kobe	C			1														
Okayama Prefecture	C			5														
Sasebo [5]																		
Taku	C		1	3														
Tokuyama	C			10														
Tokyo	C			1														
Siam:																		
Bangkok	C	1		2														
Provinces	C	42	16	7											3			

On vessels:

S. S. *Muinam* at Singapore from Hong Kong	2 cases	Aug. 16, 1937
S. S. *Sandviken* at Hong Kong	Present	Aug. 18, 1937
S. S. *Haiching* at Hong Kong	Present	Do.
S. S. *Talma* at Singapore from Hong Kong	1 case	Aug. 20, 1937
S. S. *Cremer* at Singapore from Amoy, Hong Kong, and Swatow	1 case	Aug. 21, 1937

On vessels—Continued.

S. S. *Tyndareus* at Kobe from Hong Kong and Dairen	1 case	Aug. 27, 1937
S. S. *Manila Maru* at Moji from Hong Kong	1 case	Aug. 31, 1937
S. S. *Anking* at Singapore from Hong Kong	1 case	Sept. 10, 1937
S. S. *Sphinx* at Singapore from Hong Kong	1 case	Sept. 15, 1937
S. S. *Klungchow* at Hong Kong from Shanghai	3 cases	Oct. 3, 1937
S. S. *Ranee* at Calcutta from Port Said and Blyth	1 case	Dec. 13, 1937

[1] For 2 weeks.

[2] El Tor strain.

[3] Imported.

[4] For reports prior to Aug. 1, 1937, see previous issues of PUBLIC HEALTH REPORTS.

[5] A report states that up to Sept. 30, cholera was reported in Japan, as follows: Hiogo Prefecture, 1 case, 1 death; Hiroshima Prefecture, 40 cases, 14 deaths; Yamaguchi Prefecture, 2 cases, 1 death. During the week ended Mar. 12, 1938, 1 case of cholera was reported at the naval shipyard at Sasebo, Japan.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE[1]

[C indicates cases; D, deaths; P, present]

Place		Aug. 1-28, 1937	Aug. 29-Sept. 25, 1937	Sept. 26-Oct. 30, 1937	Oct. 31-Nov. 27, 1937	Week ended— December 1937 4	11	18	25	January 1938 1	8	15	22	29	February 1938 5	12	19	26
Argentina. (See table below.)																		
Belgian Congo	C			[3] 2					2									
Bolivia:																		
Oropeza Province	C										2							
Sucre	C										[3] 1							
Tarija Department	C										1			50				
Brazil. (See table below.)																		
British East Africa:																		
Kenya	C	10	11	15	10										1			
Tanganyika	C	1																
Uganda	C	32	50	51	67	14	6	10	8	5	6	5	12	11	2	7		
	D	32	48	40	56	12		10	8	5	6	4	12	12	2	7		
Ceylon:																		
Colombo	C	1		1	1		1			1						1		1
	D	1		1	1		1				1					1		1
Plague-infected rats			2	3														
China:[4]																		
Dutch East Indies:																		
Java and Madura	C	215	213	223	311	82	50	49	66	67								
	D	215	212	220	311	82	50	40	66	67								
Pasoeroean (vicinity of)	C				5	2				2								
Ecuador:																		
Colimes	C										1							
Guayaquil	C	1		2			1		1		1	1	1	1	2			3
	D	1		2			1					1	1		2			
Plague-infected rats		2	1	2	3	1			1							3		
Parroquia Eloy Alfaro	C				1													
Egypt:																		
Asyut Province	C				1					1								
Beheira Province	C							1										
Gharbiya Province	C												1					
Girga Province	C			1														

Hawaii Territory:[5] Plague-infected rats:																		
Hawaii Island—Hamakua District:																		
Hamakua Mill Sector[5]		8	4	3	4	7	-----	-----	1	1	-----	-----	-----	-----	1	-----	1	-----
Paauhau Sector[5]		1	1	1	5	-----	-----	-----	2	-----	1	2	3	2	-----	2	1	-----
Paauilo		-----	-----	-----	-----	2	13	3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Maui Island:																		
Makawao District—Plague-infected rats		-----	-----	-----	-----	1	3	2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Omaopio[5]		-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Wailuku District—Puunene	D	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----
India	C	962	1,697	1,996	1,874	440	400	391	215	185	510	298	-----	-----	-----	-----	-----	-----
	D	522	747	821	742	215	175	164	104	99	237	187	-----	-----	-----	-----	-----	-----
Bassein	C	2	2	-----	-----	-----	-----	-----	-----	1	-----	-----	-----	[6] 1	1	-----	-----	1
Bombay Presidency	C	43	62	82	59	15	10	10	16	8	-----	-----	2	14	-----	-----	-----	-----
	D	25	42	48	36	17	8	4	8	4	-----	-----	2	7	-----	-----	-----	-----
Central Provinces and Berar	C	85	285	582	592	109	147	80	54	36	91	58	113	188	232	190	156	260
Cochin	C	-----	2	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Karachi	C	-----	12	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Madras Presidency	C	203	111	80	175	23	52	16	69	67	65	81	-----	-----	-----	-----	-----	-----
	D	98	59	41	84	13	28	5	38	38	35	53	-----	-----	-----	-----	-----	-----
Punjab	C	17	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Rangoon	C	5	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	[6] 1	-----	1
Sind State	C	-----	8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Indochina (French) (see also table below): Sadec	C	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Madagascar. (See table below.)																		
Niger Territory. (See table below.)																		
Peru. (See table below.)																		
Senegal: Dakar	C	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Tunisia: Tunis: Plague-infected rats		-----	-----	-----	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	1	-----
Union of South Africa	C	-----	[7] 1	[7] 1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
United States:[8]																		
California:[8 9 10]																		
Eldorado County—Plague-infected fleas.																		
Fresno County[9]	C	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Plague-infected fleas.																		
Plague-infected ground squirrels		-----	3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Placer County[10]—Plague-infected fleas.																		
San Bernardino County—Plague-infected fleas.																		

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[1] Including plague in the United States and its possessions.

[2] Includes 1 case of pneumonic plague.

[3] Pneumonic plague.

[4] Plague has been reported in China as follows: Information dated Aug. 18 reports an outbreak in West Hsingan (Khingan) and Southern Lungkiang Provinces. Information dated Sept. 2 states that 115 cases and 105 deaths occurred in Manchuria.

[5] Plague has also been reported in Hawaii Territory as follows: Week ended Aug. 14, 1937, 1 lot of 5 rats and 1 lot of 3 mice, by mass inoculation in Hamakua Mill Sector; week ended Nov. 20, 10 rats by mass inoculation in Omaopio, Makawao District, Maui Island; week ended Mar. 5, 1 plague-infected rat in Paauhau Sector, Hamakua District, Island of Hawaii.

[6] Imported.

[7] For 2 weeks.

[8] Plague infection proved in insect hosts as follows: *California*—Eldorado County, Aug. 31; Fresno County, Oct. 7–Nov. 5; San Bernardino County, July 12–Sept. 8; San Mateo County, July–Aug. 27; Santa Cruz County, Feb. 3, 1938. *Nevada*—Ormsby County, July 2–Aug. 20. *Utah*—Morgan County, reported Aug. 10.

[9] For 5 weeks ended Nov. 6, plague infection proved in pooled tissue from squirrels, chipmunks, and mice in Fresno County, Calif.

[10] For week ended Oct. 9, plague infection proved in pooled tissue from squirrels, chipmunks, and rats, and week ended Oct. 30, pooled tissue from squirrels, in Placer County, Calif.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER Continued

PLAGUE—Continued

[C indicates cases; D, deaths, P, present]

Place	Aug. 1-28, 1937	Aug. 29-Sept. 25, 1937	Sept. 26-Oct. 30, 1937	Oct. 31-Nov. 27, 1937	Week ended— December 1937 4	11	18	25	January 1938 1	8	15	22	29	February 1938 5	12	19	26
United States—Continued.																	
California Continued.																	
San Mateo County—Plague-infected fleas, lice, and ticks.																	
Santa Cruz County—Plague-infected fleas.																	
Montana: Madison County—Plague-infected squirrels.	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nevada:[8] Ormsby County—Plague-infected fleas and lice.																	
Utah:[8]																	
Morgan County—Plague-infected fleas.																	
Wasatch County—Plague-infected ground squirrel.	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Washington: Adams County—Plague-infected ground squirrel.[11]																	

Place		August 1937	September 1937	October 1937	November 1937	December 1937	January 1938
Argentina:							
Cordoba Province	C	-	1	-	-	-	-
Salta Province	C	[3] 1	-	-	-	-	-
Brazil:[12] Pernambuco State	C	5	-	-	5	-	-
Indochina (French) (see also table above): Cochinchina	C	-	1	-	-	-	-
Madagascar (central region)	C	22	48	59	67	57	69
	D	22	47	59	65	56	65
Niger Territory	C	-	-	-	85	60	-
Peru	C	3	5	9	12	6	-
Ancash Department	C	-	-	-	3	-	-
Lambayeque Department	C	2	2	1	-	-	-
Libertad Department	C	1	-	2	1	-	-
Lima Department	C	-	3	6	8	6	-

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[3] Pneumonic plague.

[8] Plague infection proved in insect hosts as follows: *California*—Eldorodo County, Aug. 31; Fresno County, Oct. 7-Nov. 5; San Bernandino County, July 12-Sept. 8; San Mateo County, July-Aug. 27; Santa Cruz County, Feb. 3, 1938. *Nevada*—Ormsby County, July 2-Aug 20. *Utah*—Morgan County, reported Aug. 10.

[11] During the week ended Mar. 12, 1938, 1 plague-infected squirrel was reported in Adams County, Wash.

[12] For the year 1937, 35 cases of plague with 15 deaths were reported in Brazil as follows: Bahia State, 5 cases, 5 deaths; Ceara State, 2 cases; Parahyba State, 5 cases, 1 death; Pernambuco State, 23 cases, 9 deaths.

SMALLPOX

Place		Aug. 1–28, 1937	Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Week ended—												
						December 1937				January 1938					February 1938			
						4	11	18	25	1	8	15	22	29	5	12	19	26
Algeria: Algiers Department	C			1														
Angola. (See table below.)																		
Argentina. (See table below.)																		
Belgian Congo. (See table below.)																		
Bolivia. (See table below.)																		
Brazil:																		
Bahia (alastrim)	C	10	6	11	6	9												
Porto Alegre (alastrim)	D	2																
Recife (alastrim)	C		1															
Santos	C				1													
British East Africa: Tanganyika	C	186	121		223									1	127	10		
Canada:																		
Alberta	C											[1]1		[1]1				
British Columbia	C													[1]1				
Quebec	C				[1]1													
Saskatchewan	C	[1]1										[1]1						
China:																		
Canton [2]	C				1			1	1									
Dairen	C	2			1													
Foochow	C	P	P	P	P			P										
Hankow	C	1												2				
Hong Kong	C	82		1	6	4	2		7	8	30	26	75	116	101	156	222	162
	D										15	22		70	88	83	190	132
Macao	C															2		
Shanghai	C	2	1				1					2	3				6	3
Tientsin	C							1										
Colombia (see also table below): Barranquilla	D			2														
Ecuador: Guayaquil	C	20	3	13	4		2		1	2	1		1					1
Eritrea	C		28	52	16													
France. (See table below.)																		
Great Britain: England and Wales—Chester County	C				1													
Greece. (See table below).																		
Guatemala. (See table below.)																		

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[1] For 2 weeks.

[2] A report dated Feb. 12, 1938, states that for the 3 weeks ended Feb. 12, 1938, 100 cases of smallpox were admitted to hospitals in Canton, China.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		Aug. 1-28, 1937	Aug. 29-Sept. 25, 1937	Sept. 26-Oct. 30, 1937	Oct. 31-Nov. 27, 1937	Week ended -												
						December 1937				January 1938					February 1938			
						4	11	18	25	1	8	15	22	29	5	12	19	26
India	C	3,026	1,738	1,756	1,801	718	950	1,205	1,018	1,587	1,662	1,741						
	D	910	461	420	408	147	221	207	200	507	506	541						
Assam	C	98	58	45	37	12	16	20	8	21	13	13	19	29	18	19	15	38
Bassein	C													1				
Bombay Presidency	C	177	181	154	130	102	83	205	180	229	208		292	401	523			
	D	53	38	33	41	27	28	51	59	57	60		91	108	150			
Bombay	C	28	47	41	73	50	43	66	110	82	92	164	163	189	222	249	233	246
	D	18	23	23	30	19	23	23	51	47	49	86	81	87	125	132	116	112
Calcutta	C	40	28	20	24	3	15	20	31	43	46	46	52	48	56	106	120	119
	D	16	17	14	13	2	11	13	17	31	35	34	31	46	27	77	76	94
Cawnpore	C										9		2	3	5	4	4	5
Central Provinces and Berar	C	61	44	26	7	1		8	6	2	9	11	22	7	39	46	55	90
Chittagong	C										1		2				1	
Delhi	C	7		1			1	2	3	2	³ 4		1	2	6	1	5	1
Karachi	C		³ 2		2	³ 1			3	3	³ 3	6	3	3		4	6	2
Madras Presidency	C	415	318	304	213	30	62	30	123	111	137	149						
	D	95	62	51	26	6	15	5	25	25	21	31						
Madras	C	102	76	74	50	10	10	19	49	58	50	64	107	80	76	71	58	43
Negapatam	C															6		
Northwest Frontier Province	C	76	27	154	380	16	113	139	119	277	106	88	202	75	32	39	40	43
Orissa Province	C	310	117	193	206	63	94	69	127	102	147	93	287	202	198	184	218	
Punjab	C	165	69	162	404	192	300	226	317	310	332	380	337	282	250	181	251	
Rangoon	C	³ 1		3	5		1		5	7	9	17	19	14	12	16	5	
Sind State	C	209	96	78	104	75	79	52	230	97	67	119	201	159	127	64	124	167
Indochina (French) (see also table below):																		
Tonkin Province	C								26		75	60			135	130	160	282
Haiphong	C				2		4	21	11	14	41	32	31	51	45	52	27	21
Hanoi	C								1	1		2	1	1	3	8		4
Saigon-Cholon	C													1			1	
Iran	C	3			2								4		6			
Teheran	C	1																

Iraq	C	5	-----	-----	-----	-----	-----	-----	-----	5	-----	6	1	1	-----	-----	-----	-----
Baghdad	C	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	-----	-----
Mexico (see also table below):																		
Chihuahua	C	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Durango	D	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	-----	-----	1
Mexico, D. F	C	8	6	5	11	2	-----	-----	-----	-----	-----	2	-----	-----	-----	3	-----	-----
Monterrey	C	1	2	-----	1	1	-----	-----		-----	1	1	2	1	-----	-----	1	-----
San Luis Potosi	D	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Torreon	C	3	1	-----	-----	-----	1	-----	1	-----	1	-----	5	1	-----	-----	-----	-----
	D	7	3	5	4	1	2	-----	4	-----	2	-----	1	1	1	-----	1	-----
Vera Cruz	C	-----	-----	-----	-----	1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Morocco. (See table below.)																		
Nigeria	C	71	11	156	20	-----	50	-----	86	-----	104	-----	-----	-----	-----	-----	-----	-----
Nyasaland	C	12	-----	31	11	-----	-----	3	-----	3	-----	-----	-----	-----	-----	-----	-----	-----
Panama Canal Zone: Colon	C	-----	-----	2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Portugal (see also table below):																		
Lisbon	C	1	5	3	3	-----	1	-----	1	-----	-----	4	-----	-----	1	-----	1	-----
Oporto	C	-----	2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Portuguese East Africa. (See table below.)																		
Salvador. (See table below.)																		
Senegal. (See table below.)																		
Siam	C	1	-----	-----	-----	-----	-----	-----	-----	35	12	12	16	1	-----	-----	-----	26
Sierra Leone	C	5	-----	10	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Southern Rhodesia	C	-----	-----	4	121	12	-----	3	99	-----	10	-----	3	-----	-----	-----	-----	-----
Straits Settlements: Singapore	C	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	1	-----	-----	-----	-----
Sudan (Anglo-Egyptian)	C	6	27	64	88	14	13	18	19	44	28	2	81	127	22	25	9	
Union of South Africa. (See table below.)																		
Venezeula: Puerto Cabello.[4]																		

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[3] Imported.

[4] A report dated Feb. 10, 1938, states that 16 cases of smallpox were reported in Puerto Cabello; information dated Feb. 21, states that 4,000 cases of smallpox (alastrim) were reported in Barquisimeto, Lara State, Venezuela, and that smallpox is present from Barquisimeto to Valencia and Marcay.

On vessels:

S. S. *Empress of Japan* at Kobe from Manila	1 case	Aug. 11, 1937
S. S. *Northern Prince* at New York from Rio de Janeiro	1 case	Aug. 10, 1937
S. S. *Empress of Asia* at Honolulu	1 case	Sept. 5, 1937
S. S. *Castalia* at Suez from Karachi and Bombay	1 case	Oct. 5, 1937
S. S. *Egra* at Rangoon from Calcutta	1 case	Nov. 16, 1937
S. S. *Anhui* at Singapore from Hong Kong	1 case	Jan. 19, 1938
S. S. *Rizwani* at Kamaran	1 case	Jan. 19, 1938
S. S. *Suisang* at Penang from Hong Kong and Singapore	1 case	Jan. 26, 1938

On vessels—Continued.

S. S. *Hong Siang* at Singapore from Amoy, Swatow, and Hong Kong	1 case	Jan. 26, 1938
S. S. *Trane* at Singapore from Hong Kong	1 case	Jan. 27, 1938
S. S. *Muinam* at Singapore from Hong Kong	1 case	Jan. 29, 1938
S. S. *Tatsuta Maru* at Honolulu	1 case	Feb. 4, 1938
S. S. *Circassia* at Aden from Bombay	1 case	Feb. 16, 1938
S. S. *Empress of Japan* at Honolulu	1 case	Feb. 21, 1938

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		August 1937	September 1937	October 1937	November 1937	December 1937	January 1938
Angola	C	12	18				
Argentina	C			3	1		
Belgian Congo	C	312	391	352	166	232	
Bolivia: La Paz	C		30				
China: Manchuria—Harbin	C					1	
Colombia (see also table above)	C	[1] 209					
France	C				2		
Greece: Salonika	C				3	7	10
Guatemala	C	1					
Indochina (French) (see also table above)	C	220	96	147	197	310	
	D	63	12	28	43	91	
Mexico (see also table above):							
Aguascalientes State	C		5				
Campeche State	C		1				
Chihuahua State	C		4		21		
Coahuila State	C		2		17		
Durango State	C		15		17		
Guanajuato State	C		7		38		
Hidalgo State	C		1				
Jalisco State	C		5				
Mexico State	C		3		3		
Mexico—Continued (see also table above):							
Mexico, D. F.	C	9	11	5	17		
Mexico City	D	1	2				
Michoacan State	C	4	37		59		
Nayarit State	C		1				
Nuevo Leon State	C		2		6		
Queretaro State	C	1	5	1	2		
Sinaloa State	C		3				
Tabasco State	C		1		1		
Tlaxcala State	C		3		3		
Vera Cruz State	C		2	1	25		
Yucatan State	C				1		
Zacatecas State	C		1		7		
Morocco	C		1	1	2		
Portugal (see also table above)	C		61	53	52	18	
	D		8	1	4	3	
Portuguese East Africa	C				8		
Salvador	C						16
Union of South Africa:							
Cape Province	C					42	
Transvaal	C					11	

---

[1] For July and August.

TYPHUS FEVER

[C indicates cases; D deaths; P, present]

Place		Aug. 1-28, 1937	Aug. 29-Sept. 25, 1937	Sept. 26-Oct. 30, 1937	Week ended—															
					November 1937				December 1937				January 1938					February 1938		
					6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	10
Algeria:																				
Algiers Department	C	30	7	38	18		[1] 27	44		6		7				13	11	8	5	
Algiers	C	3		15														2		
Constantine Department	C	83	26	47	1		[1] 14	8	20	37		15	21		[1] 26	50		20	13	10
Bone	C	4		1						1							2		1	
Constantine	C	7	2	7												1		4	20	
Philippeville	C			2				1										1	1	
Oran Department	C	7	4				[1] 13	3	2			20	1		[1] 3		1	6	2	
Southern Territories	C	1						2		1							1	13	1	
Australia: Brisbane	C													1						
Basutoland	C	9	6	3																
British East Africa: Kenya	C														1					
Bulgaria	C			13							5					1			2	
Chile	C		176	305	50	50	75	102	57	32	64	43								
Antofagasta Province	C		1		1	1	1	1												
Concepcion Province	C	16	7	4		1	1		1											
Iquique	C				1						1									
Linares Province	C	6	5	2		1	1	10	2	1										
Malleco Province	C	8	6	4	2		1			3										
Nuble Province	C	3	14	24	9	5		5	5	7	5	2								
Santiago Province	C	151	114	230	35	40	65	83	44	20	57	36								
Valparaiso	C	47	14	10		1	2	2	1					1	2	1	2		1	
China (see also table below):																				
Canton	C			3																
Dairen	C			1				2			1									
Hankow	C	1		2													1			
Shanghai	C		2											1						
Swatow	C																			
Tientsin	C	1	3	1	4		1	2	4				1							
Chosen. (See table below.)																				
Egypt:																				
Alexandria	C	13	4	4	3	1	3		2			1	1							1
Asyut Province	C	2		1											1					
Beheira Province	C	1													6	3				
Beni-Suef Province	C				1															
Cairo	C		1							1			3						1	1
Dakahliya Province	C	3													1					

[1] For 2 weeks.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER—Continued

[C indicates cases; D, deaths; P, present]

Place		Aug. 1-28, 1937	Aug. 29-Sept. 25, 1937	Sept. 26-Oct. 30, 1937	Week ended -															
					November 1937				December 1937				January 1938					February 1938		
					6	13	20	27	4	11	18	25	1	8	15	22	20	5	12	19
Egypt—Continued.																				
Gharbiya Province	C														3					
Minufiya Province	C															3				
Minya Province	C	1																		
Qena Province	C														1					
Suez	C		2																	
Provinces	C		10	3	2	4		1	1		4	2	6	11	12	6	26	21	40	51
Eritrea: Asmara	C					2														
Germany: Frankfort-on-Main	C			1																
Great Britain—England and Wales—Gloucester County	C						1													
Greece. (See table below.)																				
Guatemala. (See table below.)																				
Hawaii Territory: Honolulu	C	1	2	4			1				1		1	1					1	
Iran	C		1								4									
Latvia. (See table below.)																				
Libya. (See table below.)																				
Lithuania. (See table below.)																				
Mexico (see also table below):																				
Chihuahua	C							2												
Mexico, D. F.	C	27	22	17	4	3	7	4	13	3	3	1		12	1				4	
Saltillo	D																		1	
San Luis Potosi	D																	1		
Tecamachalco	C												7							
Torreon	C					1											1			
Morocco (see also table below)	C	21	16	38	1		6	22	18	58	102	137	198	80	139	142	184	131	204	208
Casablanca	C	5		4							4	20		16	6		57	44	45	67
Netherlands: Rotterdam	C										[1] 1									
Nigeria	C			2																
Palestine:																				
Haifa	C	4	11	10	3		2		3	3	2		2			1	1			
Jaffa	C	9	9	13	2	5	4	6			2	1			3	2		1	1	1
Panama Canal Zone. (See table below.)																				

Poland	C	43	20	53	12	10	23	23	37	40	35	20	74	98	78	87	79	112	76	------
	D	4	------	1	2	1	------	2	------	1	1	1	1	6	7	9	7	6	6	------
Portugal. (See table below.)																				
Rumania. (See table below.)																				
Sierra Leone: Freetown	C	------	------	------	------	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------
Straits Settlements: Singapore	C	------	1	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Switzerland		------	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Trans-Jordan	C	------	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------	2	------	------
Tunisia:																				
Tunis	C	10	7	3	------	------	3	------	1	------	------	1	2	------	------	------	------	2	------	1
Provinces	C	216	76	132	23	29	63	46	11	34	------	12	12	26	80	62	101	37	32	83
Turkey. (See table below.)																				
Union of South Africa. (See table below.)																				
Yugoslavia: Belgrade	C	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
On vessel: S. S. *Blackhill* at Philippeville	C	------	------	------	------	------	------	------	------	------	------	------	------	------	------	1	------	------	------	------

Place		August 1937	September 1937	October 1937	November 1937	December 1937	January 1938
China: Manchuria—Harbin	C	8	2	------	------	------	------
Chosen	C	------	------	19	------	------	------
Greece	C	3	6	18	7	7	------
Guatemala	C	10	6	2	------	------	3
Latvia	C	------	1	------	------	------	------
Libya	C	------	------	------	------	------	------
Lithuania	C	------	2	6	7	------	------
Mexico (see also table above):							
Aguascalientes State	C	------	1	------	1	------	------
Campeche State	C	------	2	------	------	------	------
Coahuila State	C	------	------	------	3	------	------
Durango State	C	------	1	------	8	------	------
Guanajuato State	C	------	10	------	22	------	------
Guerrero State	C	------	------	------	2	------	------
Hidalgo State	C	3	4	2	10	------	------
Jalisco State	C	------	2	------	2	------	------
Mexico State	C	38	29	19	42	------	------
Mexico D. F.	C	27	29	14	20	------	------
Mexico City	D	3	4	------	------	------	------
Michoacan State	C	------	5	------	11	------	------
Mexico—Continued.							
Oaxaca State	C	------	------	------	3	------	------
Puebla State	C	------	55	------	9	------	------
Queretaro State	C	2	3	2	2	------	------
San Luis Potosi State	C	------	6	4	------	------	------
Tamaulipas State	C	------	2	------	------	------	------
Tlaxcala State	C	------	3	------	------	------	------
Vera Cruz State	C	------	9	------	------	------	------
Zacatecas State	C	------	2	------	6	------	------
Morocco (see also table above)	C	25	16	39	47	914	633
Panama Canal Zone	C	1	1	------	------	------	------
Portugal	C	2	1	26	28	7	------
Rumania	C	26	31	33	110	246	------
Turkey	C	23	27	100	34	45	------
Istanbul	C	2	4	------	4	2	------
Union of South Africa:							
Cape Province	C	81	------	102	75	100	------
Natal	C	2	------	------	9	1	------
Orange Free State	C	2	------	3	3	3	------
Transvaal	C	------	------	5	1	1	------

---

[1] Suspected.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER

[C indicates cases; D, deaths; P, present]

Place		Aug. 1-28, 1937	Aug. 20-Sept. 25, 1937	Sept. 26-Oct. 30, 1937	Week ended— November 1937				December 1937				January 1938					February 1938		
					6	13	20	27	4	11	18	25	1	8	15	22	29	5	12	19
Belgian Congo:[1]																				
Saratumba.[1]																				
Zongo [1]	C																		[2] 7	
	D																		4	
Brazil:																				
Amazonas State	D	1																		
Matto Grosso State [3]	D																			
Minas Geraes State	D													1	2	7	6	10	2	
Para State [3]	D	1	1													1				
Rio de Janeiro State	D															1	3	2		
Santa Catharina State	D								1									1		
Sao Paulo State	C																		P	
Colombia:																				
Boyaca Department	C	1																		
	D	2		1							1									
Caldas Department	D		1																	
Cundinamarca Department	D	2	2												1					1
Intendencia of Meta—Villavicencio	D		1																	
Santander Department	C		2																	
	D	4	6	3						1		2								
Dahomey: Cotonou	C										[2] 5									
French Equatorial Africa:																				
Bangui	D		1												1					
Fort Archambault	C		[2] 2																	
Gambia: Georgetown	C														[2] 1					
Gold Coast	C	9	3	4	[4] 7			[2] 1			2		[4] 5	[4] 4						
	D	4	2	1	2			[2] 1			2									
Accra	C	1	[2] 1																	
Keta	C												1							
Ivory Coast:																				
Abidjan	C																	1		[2] 1
Agboville	C	1																		
Anyama	C													1						
Gaoua	C		[4] 3						[2] 1											
	D		1																	

Spao Plantations (near Bingerville).[5]																				
Touba	C	------	[2]1	[2]1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Nigeria	C	5	2	5	------	------	------	2	------	------	------	[2]1	1	------	1	------	------	------	------	------
	D	------	------	------	------	------	------	1	------	------	------	------	------	------	1	------	------	------	------	------
Paraguay: Asuncion	C	------	------	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------
Senegal	C	2	2	12	[6]8	2	------	2	1	------	1	1	------	------	------	------	------	------	------	[2]1
	D	1	------	------	1	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------
Dakar	C	------	------	1	[7]2	------	------	------	------	------	------	------	------	------	------	------	------	------	------	[2]1
Rufisque	C	------	------	2	------	2	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Thies	C	------	------	4	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------
Sudan (French)	C	------	------	------	------	------	------	------	------	------	------	------	1	------	------	------	------	------	------	------
San	C	------	------	------	------	------	------	------	------	------	------	1	1	------	------	------	------	------	------	------
Toukoto	C	------	------	------	------	[2]1	------	------	------	------	------	------	------	------	------	------	------	------	------	------

---

[1] Yellow fever has also been reported in Belgian Congo as follows: Week ended Mar. 5, 1938, 1 suspected case in Saratumba and 4 suspected cases with 1 death at Zongo.

[2] Suspected.

[3] See also reports of yellow fever in Brazil on pp. 216, 280, 361, and 404 of the PUBLIC HEALTH REPORTS for 1938, and in various issues for 1937.

[4] Includes 1 suspected case.

[5] During the week ended Mar. 12, 1938, 2 cases of yellow fever with 1 death were reported in Spao Plantations near Bingerville, Ivory Coast.

[6] Includes 3 suspected cases.

[7] Imported.

×

UNITED STATES TREASURY DEPARTMENT

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IN THIS ISSUE

The Unequal Distribution of Opportunities for Health
Maintaining Proper Relative Pressures in Milk Regenerators
Effect of Certain Small Water Filters on Bacteria Counts

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THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst Surg Gen. ROBERT OLESEN, *Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PUBLIC HEALTH REPORTS

VOL. 53 APRIL 1, 1938 NO. 13

DIFFERENCES IN OPPORTUNITIES FOR HEALTH[1]

By JOSEPH W. MOUNTIN, *Surgeon*, and HAZEL O'HARA,
United States Public Health Service

One errs only on the side of platitude in pointing out that the average American wishes to postpone the unhappy event of his death as long as possible, and that he sets a high value on spending the intervening time in physical comfort. He is oriented to a civilization wherein sanitation throws a cordon of safeguards about him, and medical science stands by to help him resist the onslaughts of accidents and disease. The one he accepts as operating automatically in the background of his life; the other he calls for when some part of his organism signifies that trouble is brewing. Ask a random selection of individuals what, in their opinion, is the element most necessary to the satisfying life, and the chances are that nine out of ten will answer, "Good health." It is surely due to no accident that our most frequent salutation is "How are you?"

Despite this high value placed on feeling well, an anomalous situation prevails in the application of the personal services which medical science has to offer. While it is generally accepted that there must be numerous halls of learning to which each generation may turn its steps for the purpose of cultivating the mind, public thinking does not include any comparable scheme for promoting health. Illiteracy has become déclassé, but not sickness and disability.

Without a doubt, if health promoting measures were applied on the same broad scale as are educational measures, they would relieve much personal and group misery present in the country today and lighten the financial burdens that illness now lays upon society. A talented Robert Louis Stevenson, stricken with tuberculosis, may yet meet life so charmingly that the children of his mind survive him as a boon to millions of people. But the day laborer suffering from the same disease may bequeath his physical children, perhaps also infected, to society for support.

---

[1] From the Division of Public Health Methods, National Institute of Health. Presented at the Thirty-third Annual Session of the Massachusetts Conference of Social Work, Boston, Mass., December 1, 1937.

Chief among life's ironies one might point to the spread of sickness among those who possess few of the comforts of existence. This controverts a certain superficial opinion, now on the wane, that the poor, through some mysterious immunity arising from poverty, preserve their health, while the rich riotously throw theirs away. The poor may not suffer from diabetes to the same extent as do the rich, but the consensus of a large number of surveys shows that there is much excess of sickness among the poor and relief families from tuberculosis, pneumonia, nephritis, and rheumatism. The rate for disabilities from other important diseases and from accidents is also higher among the poor.

Surveys of health have long indicated that illness rates in general are highest among the poor and decline with increasing income.

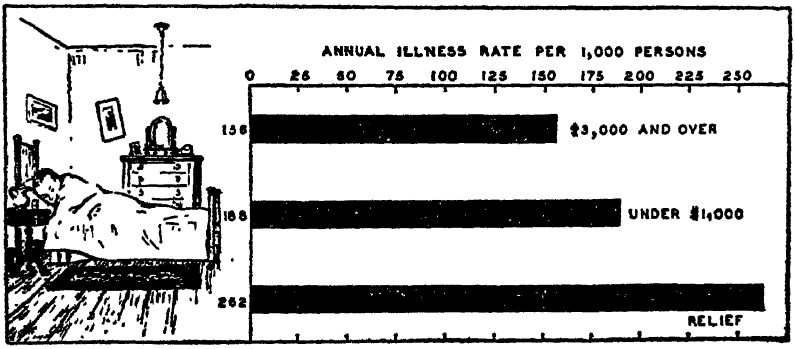

FIGURE 1.—Frequency of illness per annum among members of families in selected income brackets.

One study of 9,000 families in 18 States showed that wage-earners in families having less than $1,200 annual income lost more than twice as many days per person per year as did gainful workers in families whose income was more than $3,000 (*1*). The loss of even a day's wages to a laborer's family may spell distress, whereas among those families in the second group it may be of very little moment.

Inquiries made during the past few years have penetrated into the wide strata of relief families and reveal that the total illness rate of the poor on relief definitely exceeds that of the poor who are not on relief. By using inability to work for 7 days or longer as a measure of illness, it was found through a survey of 280,000 persons in 8 large cities that a total illness rate of 156 cases per 1,000 persons prevailed among families having annual incomes of $3,000 or more, as compared with rates of 188 for families with annual incomes of less than $1,000, and 262 for families receiving public relief (*2*). These figures indicate a concentration of poverty, sickness, and general misery to an extent that most individuals not directly experiencing them would find hard to imagine.

Mortality rates by broad occupational groups also reveal that sickness tends to camp among those who are least able to put up with it. In the United States, for instance, the death rate from pulmonary tuberculosis among skilled laborers is nearly three times what it is among professional workers, and among unskilled laborers it is seven times the rate for professional men. Other occupational groups fall between these extremes. The mortality rate for pneumonia among unskilled workers is three and one-half times the rate among professional workers. The same statement holds true for accidents. Mortality rates from cancer and from heart and kidney diseases, on the increase as the average span of life is lengthened, show an excess of 30 to 50 percent for laborers as compared with higher salaried people. The death rate from all causes is about 25 percent higher for skilled laborers than it is for those in intellectual pursuits, and for unskilled laborers it is more than 100 percent higher (*3*).

The poorer classes also experience greater loss through infant deaths than do those better off. In a recent study made in Denver it was found that infants in families with an annual income of less than $500 died at a rate of 168 per 1,000 live births, as contrasted with 30 per 1,000 in families having incomes of $3,000 or more (*4*). The whole problem of caring for the infant and the mother, of reducing the mortality and morbidity rates of both, demands a confluence of medical, public health, social, and economic measures.

All these measures enter into the problem of clearing up the unwholesome conditions of existence; now one and then another stands out as being at the moment most important. One family may stand in need of actual medical care, while their next door neighbors find their troubles best eased through the help of an experienced social worker. Poor housing, insufficient food and clothing, overfatigue, worry, disease, all enter into the picture. Medicine cannot be offered as a cure-all. It cannot be counted upon to combat successfully diseases directly contingent upon social causes. It can, however, do an enormous amount of good. But there exists between the science of medicine and a large sector of the public an obstacle marked "Ability to pay." Only a relatively small proportion of those who have no money and are in need of help find their way around it.

Any one who lets himself be aware of the unpleasant side streets of existence is able to cite offhand the sort of personal dramas that take place under this scheme of distribution. A mother who has to exercise financial legerdemain to keep the landlord and grocer in good humor simply cannot get the money together for an adenoid operation for little Stella. The child goes on breathing through her mouth and adding to the several factors which alter the proper contours of her face; thus she is being marked for that particularly piercing humiliation which comes to those who do not conform to the norm in physical appearance. A shop worker whose wages are perpetually attached experiences fever, sweating, and lassitude but puts off going to the doctor with "maybe next month we can spare the money." When he has reached the point of going to a physician, tuberculosis is well advanced and the man has also reached a milestone in his shortened life beyond which he will never earn wages again.

Surveys that have been made express the same facts in a quantitative way. They show that the poor receive less medical care per person and much less per case of illness than do those in more fortunate circumstances. Even among families financed on a modest scale, the percentage of illnesses attended by a doctor increases noticeably with small differences in income. Among the 29,000 persons surveyed in 7 large cities, 59 percent of the illnesses causing inability to work were attended by a doctor in families with an income of less than $150 per capita per annum, while 71 percent were attended in those families whose income was $425 or more per capita. The average of calls per case attended for the first group was 4.2 and for the second 6.4 (*5*).

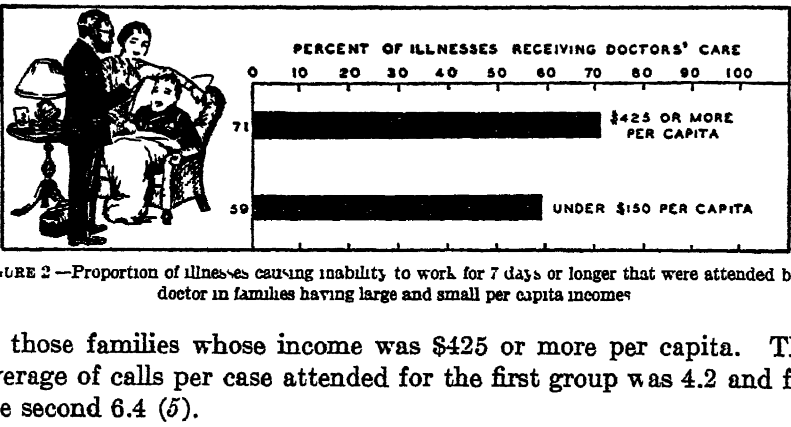

FIGURE 2.—Proportion of illnesses causing inability to work for 7 days or longer that were attended by a doctor in families having large and small per capita incomes

The same survey shows that the poor fare a little better in hospital care than those who are just a step or so above being poor, presumably because of a fair supply of free hospital beds in large cities where the studies were made. It is the family that has sufficient income to meet the ordinary necessities but not enough for expensive hospital costs that feels the pinch most when one of its members needs to go to the hospital (*6*).

The number of surgical operations, as might be expected, varies with income, especially those which are not necessarily of an emergency character but which should be performed some time. Among the poor a convenient time seldom arrives for surgery that is not absolutely necessary.

In the survey of 9,000 families in 18 States surgical operations of all kinds were recorded. Among families with annual incomes of less than $1,200, the data showed 52 operations per 1,000 persons as compared with 94 in families with $5,000 or more (*7*). This excess of 81 percent carries implications of long chances being taken by many a small wage-earner on remaining alive and well.

The rates for tonsillectomies were approximately the same for families with incomes up to $2,000, but among those whose incomes ran above $2,000 the frequency of this operation increased regularly according to salaries. Rates for appendicitis operations increased less markedly with income, but the rate among those receiving more than $5,000 a year was well above that for those living on $1,200 or less a year. Operations on benign tumors varied largely with income. The rate in the $5,000 and over income group was about six times that among families with incomes under $1,200. Thus, poverty is seen to operate directly against one of the chief admonitions to the public in the program for cancer control—"At the first sign of a lump or growth in your body, see a physician." The cancer death rate, be it noted, is now considerably higher among those in the lower income brackets than among those in the higher (*7*).

A simple emergency operation commonly required by young children is puncturing of the eardrum in cases of infection of the middle ear. If this surgical procedure is not applied, the eardrum usually bursts, after some damage has been done to the ear, but not infrequently the infectious process extends to the mastoid cells or to the meninges, in which case life may be endangered. The frequency of this operation, too, shows wide variation with income (*7*).

As to those medical services which are preventive rather than remedial, that part of the public within financial reach of medical care probably does not realize the extent to which many are forced to do without commonly accepted measures of prevention.

Periodic physical examinations might be classed offhand as a luxury of those who have money over and above their needs, and the available data bear this out. The situation among school children as expressed by gross examination rates is somewhat masked because of the volume of service of this type performed in the schools. As age increases between 15 and 45 years, the frequency of physical examinations decreases in the low income groups but tends to increase slightly among those with more means. Particularly large is the variation with income in the examination rate in the older age groups. For the ages 45 years and over, the highest income group had a physical examination rate that was more than 15 times the rate in the lowest income class (*8*).

The extent to which the younger age groups are protected by immunization is probably greatly misinterpreted. Since these services are usually performed under the supervision of the health department or the school authorities, it is easy to assume that they are distributed to one and all. Available data, however, show that these preventive measures also vary with income. In the school ages, where immunization has become largely a public function, little difference shows up in the frequency of this procedure for the various income groups. In the preschool ages, however, there appears great disparity in the volume of service described as smallpox vaccinations and diphtheria immunizations. Diphtheria immunization is particularly important in the preschool age, for the peak of the death rate from this disease occurs before children enter school. Yet in those early ages immunizations were three times as frequent among children from families with annual incomes of $5,000 or more than they were among children from those families with less than $1,200 income. Approximately the same ratio for smallpox vaccinations prevailed in the preschool ages between these income groups (*9*).

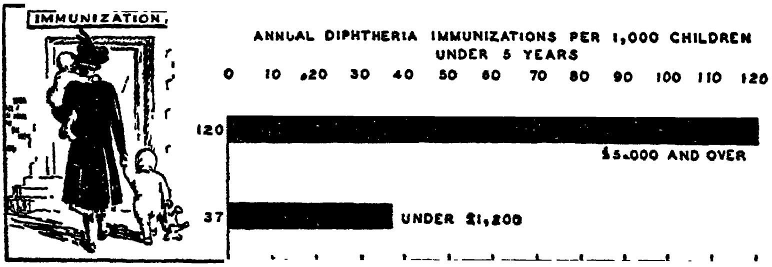

Figure 3.—Annual diphtheria immunizations per 1,000 children under 5 years in families of selected income brackets.

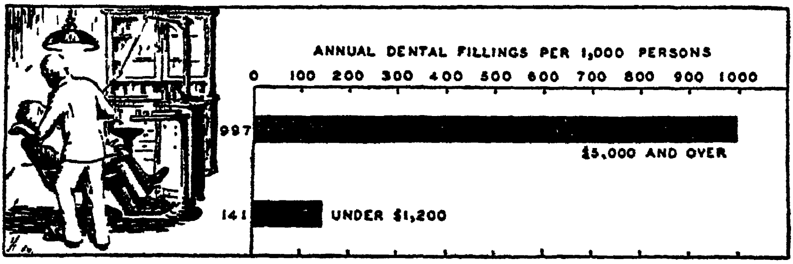

Figure 4.—Annual rate of dental fillings received by members of families in selected income brackets.

As to dental care, its value is so widely recognized that probably little notion of how many must go without it exists among those who allow for it in their budgets. Probably no other form of medical care is so completely denied the individual in the under-privileged classes. The immediately important fact is not that reparative dentistry would improve the appearance but that it is a vital element in the prevention of tooth loss and several serious diseases. While the filling of cavities in the teeth is not the complete and final answer to the problem of dental caries, the repair of dental decay is the most efficient way now known to arrest that decay and is a service which should not be denied to any person.

The same study of 9,000 families in 18 States revealed a woeful lack of dental care in the low income brackets. Dental fillings were made at a rate of 141 per 1,000 persons in families with less than $1,200 annual income, as compared with 997 in the income group of $5,000 and over. Reconstructive work was done eight to ten times more frequently in the higher income groups than among the low income families (*10*). It is not possible to explain this on the grounds that the well-to-do may need more care. Such data as are available, on the contrary, indicate that the need for care is greatest among the poor. Nor is it reasonable to assume that the poor are not as interested in dental services. In many a modest home it is accepted that as the children get through school and find work they will have their teeth "fixed up." Frequently, however, it is too late for the dentist to do more than stave off the ravages of decay a bit longer.

HEALTH FACILITIES

The lineup of the opposing forces, diseases and their scientific antagonists, seems a bit illogical, considered from the detached point of view, with medical measures reaching in the least degree those who need them most. The situation, of course, like many another is simply an outgrowth of public thought. The attitude toward public facilities for health has not been conditioned to the same degree of expectation as has the attitude toward institutions for achieving justice or education. A man does not usually rely upon the invisible powers that be to send him justice at law. Nor does he seek his education solely from books. He takes it for granted that judges and teachers are available to him in the proper public buildings and that it is to this end that tax moneys are paid into governmental exchequers.

The promotion of health, however, is not generally accepted as a major interest of government. True it is that there exist many more centers of public health activity now than there were at the beginning of this century, but a few indices will show the great inadequacy of what is being done as compared with what is needed.

A health department, the symbol of disease prevention in any community, may be appraised by the scheme of organization and by the amount of funds at its disposal. By these criteria, it is apparent that even the best of departments are not in a position to give reasonable application to what is known regarding the prevention of disease and promotion of health. Of 2,500 predominantly rural counties in the United States, only 738 employed full-time health officers in 1935, and after a year under the Social Security Act the number was only 946 in 1936 (*11*). The other rural counties depend on local practicing physicians, and in some instances on untrained laymen, for the administration of such rudimentary service as may be provided.

With respect to the employment of qualified health officers, the average performance of cities is no better than that of counties.

Most students of public health administration agree that an annual budget equivalent to $2 per capita is required for the preventive services commonly assigned to the health department. This level of public support is seldom reached. In fact, most county health department budgets fall below 50 cents, and only occasionally is a city reported to have appropriated more than $1 per capita (*12*).

Public health programs are particularly remiss in the field of illness that is unattended or only partially attended. Care of the mentally afflicted and the tuberculous is now generally accepted as a function of government. Otherwise public medical service is usually restricted by the terms of the law to those who are accepted as public charges. Budgetary perhaps more than legal restrictions now serve to confine public medical service, particularly of the home and office type, to a very small fraction of the population who might benefit therefrom.

Aside from the regular avenues of public health activity, there are, it is true, establishments where the poor may receive medical treatment. The actual number of such places is often magnified by those who refer to them with optimistic vagueness and with a dismissing wave of the hand for the whole problem of the low income and dependent groups. This rather grand idea of the extent of twentieth century benevolence has given rise to the oft repeated statement that the poor are treated as royally as the rich. The actual facts, however, reveal a rather different picture of the scope of free medical care.

Out-patient departments of hospitals are relatively few in number and for the most part are located in large cities. In all, about 770 hospitals have units that might be classed as true out-patient departments organized to serve the very low income group of the population (*13*). While it is true that many other hospitals give some care to their discharged patients and others who seek treatment of an emergency character, such service for ambulatory patients is not to be confused with that rendered in an organized out-patient department.

Hospitalization in general has this decided relationship to economic status—it is available for the most part only to those who can pay for it. This is putting the situation broadly and bluntly, and excludes certain disorders which are accepted as a public responsibility and will be considered separately. Eighty-five percent of all general and allied special hospitals are nongovernmental, and they depend for about three-fourths of their income upon fees from patients (*14*). It stands to reason that individuals of some financial status occupy most of the beds.

The distribution of hospitals gives the people of certain sections an advantage in the securing of institutional care. Generally speaking, they are concentrated in the more populous counties. In the South and West where the urbanization is less, the average distance to hospitals is greater than in the North and East. This factor of distance to be covered probably decides on many occasions whether there shall be hospitalization, especially among the poor and the nearly poor.

One striking exception to the direct relationship between hospitalization and the income of the sick is the category of mental disorders. Public care of those who are mentally ill, once a highly controversial subject, is now almost an article of political faith. To the public mind it is fitting and necessary that there be institutions erected and maintained out of tax moneys to take care of the mentally incompetent members of society.

Mental hospitals of the United States show a total of some half million beds, of which but 4 percent are nongovernmental. More than 95 percent of the beds in these tax-supported hospitals are reported occupied. Many of the government institutions report acceptance of patients beyond their rated capacity for taking care of them (*15*).

Specialists in the field of mental disorders, viewing the work at close range and with the critical attitude of the perfectionist for his chosen subject, are impressed with the immense amount of work yet to be done. They are justly disturbed by the overcrowding and the frequent failure to utilize all that medical science has to offer in this field. In a review of the general subject of hospitalization, however, that part which has to do with mental disorders stands out in high relief through the substantial way in which the burden of care has been transferred from the family to the institution.

Another exception to the general concentration of hospital treatment among those who have the means to pay for it is in the care of the tuberculous. Society's acceptance of responsibility in the treatment of tuberculosis is largely a growth of the twentieth century. So also is individual willingness to admit the condition and seek the proper place for care. Growing confidence in the curability of this disease, efforts of benevolent citizens to secure adequate care for tuberculous patients, the passage of laws to this end, and the growth of sanatoria have all combined to mold public opinion to the eminently sane conclusion that a tuberculous person without means should be able to go to a place of cure provided by the government and stay there until he is well.

The specialist in this field, too, points to the mountain of need that is still to be scaled. The facts in the case support his contention that many more beds are needed before the forces opposing this disease reach adequate proportions. Tuberculosis still leads as a cause of death among the young adult group, among the poor, and the colored (*16*). Despite the importance of prompt treatment, more than 80 percent of the cases are in a fairly advanced stage at the time of hospitalization (*17*). Minimum standards set up for treatment of this disease call for one bed for each annual death, but many of the States have not reached this quota (*18*). However far short of perfect adequacy the endeavors fall, they nevertheless have succeeded in hauling tuberculosis down from its high estate as a leader among the causes of death in 1912 to seventh place in the year 1937.

The case against syphilis has also been receiving special pleading before the bar of public opinion. The population at present is in the evolutionary process of becoming really aware of this disease and its social implications. The incidence of syphilis is enough to alarm the body politic. From data gathered by the United States Public Health Service, it is estimated that one out of ten adults in the United States today has or has had syphilis, many of whom will remain a potential treatment problem throughout life (*19*). If infected persons actually needing treatment followed it up until they had been rendered noninfectious and safe against late manifestations of the disease, present facilities would care for only 30 percent of the present syphilis treatment load.

The problem here is not that of providing institutions but of inculcating the disposition to seek treatment and to follow it up until cured. It is more nearly allied to general medicine than to the special therapy of those who need to be removed from society temporarily or permanently. It touches upon the institutional problem, however, in that syphilis leads so inevitably in many cases to mental disorders. Provision for and utilization of adequate treatment facilities would, it is believed, eliminate 10 percent of first admissions to mental institutions now occurring as a result of syphilis.

SUMMARY

Presentation of data in support of the thesis that opportunities for health are closely coordinated with economic status could be extended indefinitely, for the field is large and work that should result in reducing the differences is just under way. However, sufficient evidence of the inequality of opportunity has been established through the use of statistics which show that illness rates are higher for the poor than for the well-to-do and that general medical care, surgical operations, immunizations, and dental care are impeded by inability to pay. Furthermore health departments and hospitals are not so organized as to render adequate service to those in greatest need.

Tuberculosis and syphilis, being in the nature of scourges, may seem to lead the array of pressing problems, but the many other matters of lesser magnitude contribute to the total of evil consequences which, after all, constitute the essence of the situation which needs to be attacked. The force and the effects of the attack will depend very largely upon the answers to these questions: What trends will public thinking follow? How much responsibility will the social conscience accept? Possible changes in public thought on the subject of health are not contemplated in this discussion. It is well to recognize, however, that social action in the field of human health is not in keeping with the aphorisms that presumably express avowed interest.

REFERENCES

(*1*) Perrott, G. St. J.: The state of the Nation's health. Annals of the American Academy of Political and Social Science, vol. 188 (November 1936).

(*2*) Unpublished data from the National Health Survey conducted by the United States Public Health Service, 1935–1936.

(*3*) Whitney, Jessamine: Death rates by occupation based on data of the U. S. Census Bureau 1930. National Tuberculosis Association, New York, June 1934.

Britten, Rollo H.: Mortality by occupational class. Pub. Health Rep., vol. 49, no. 58 (September 21, 1934).

(*4*) Gengenbach, F. P.: Infant and maternal mortality in Denver. Jour. Pediat., vol. 1, no. 6 (June 1932).

(*5*) Unpublished data from the Health and Depression Studies of the United States Public Health Service, 1933.

(*6*) Perrott, G. St. J., Sydenstricker, Edgar, and Collins, Selwyn D.: Medical care during the depression. Milbank Memorial Fund Quarterly, vol. 12, no. 2 (April 1934).

(*7*) Unpublished data from the Committee on the Costs of Medical Care surveys, 1928–31.

(*8*) Collins, Selwyn D.: Frequency of health examinations in 9,000 families, based on Nation-wide periodic canvasses. 1928–31. Pub. Health Rep., vol. 49, no. 10 (March 9, 1934).

(*9*) Collins, Selwyn D.: Frequency of immunizing procedures of various kinds in 9,000 families observed for 12 months, 1928–31. Am. J. of Pub. Health, vol. 25, no. 11 (November 1935).

Collins, Selwyn D.: Frequency of immunizing and related procedures in nine thousand surveyed families in eighteen States. Milbank Memorial Fund Quarterly, vol. 15, no. 2 (April 1937).

(*10*) Unpublished data from the Committee on the Costs of Medical Care surveys, 1928–31.

(*11*) Extent of Rural Health Service in the United States, December 31, 1932, to December 31, 1936. Pub. Health Rep., vol. 52, no. 47 (November 19, 1937).

(*12*) Hiscock, Ira V.: Community Health Organization. The Commonwealth Fund, New York, 1932.

(*13*) Plumley, Margaret Lovell: General out-patient departments the important element in organized out-patient care. Hospitals, vol. 2, no. 9 (September 1937).

(*14*) Pennell, Elliott H., and Mountin, Joseph W.: The financial support of non-government hospitals as revealed by the recent Federal business census of hospitals. Hospitals, vol. 2, no. 12 (December 1937).

Hospital service in the United States. Hospital number, J. Am. Med. Assoc., vol. 108, no. 13 (March 27, 1937).

(*15*) Komora, Paul O.: State Hospitals in the Depression. The National Committee for Mental Hygiene, Inc., New York, 1934.

Patients in Hospitals for Mental Disease, 1935. Government Printing Office, 1937.

(*16*) Whitney, Jessamine S.: Any changes in tuberculosis from a statistical angle. Transactions of the Thirty-second Annual Meeting of the National Tuberculosis Association, 1936.

Britten, Rollo H.: Important causes of sickness and death. Pub. Health Rep., vol. 50, no. 41 (October 11, 1935).

(*17*) Survey of tuberculosis hospitals and sanatoriums in the United States. J. Am. Med. Assoc., vol. 105, no. 23 (December 7, 1935).

Whitney, Jessamine S.: Tuberculosis Hospitalization in the United States. National Tuberculosis Association, New York, 1933. Pages 24–25.

(18) Whitney, Jessamine S.: Tuberculosis Hospitalization in the United States. National Tuberculosis Association, New York, September 1933 (Mimeographed). Page 3.

Drolet, Godias J.: Tuberculosis hospitalization in the United States. Am. Rev. Tuber., vol. 14, no. 6 (December 1926).

Lee, R. I., and Jones, L. W.: The Fundamentals of Good Medical Care. University of Chicago Press, 1933. Page 120.

The control of communicable diseases. Report of a committee of the American Public Health Association. Pub. Health Rep., vol. 50, no. 32 (August 9, 1935).

(19) Parran, Thomas: Shadow on the Land. Reynal and Hitchcock, New York, 1937.

CONTAMINATION OF PASTEURIZED MILK BY IMPROPER RELATIVE PRESSURES IN REGENERATORS

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INTRODUCTION

Many of the larger milk pasteurization plants employ regenerators (also known as heat exchangers or regenerative heater-coolers) in which a continuous flow of hot pasteurized milk on one side of a metal partition warms the incoming raw milk on the other side. This in brief is the principle of the milk-to-milk regenerator. Another type is the milk-to-water-to-milk regenerator, in which the pasteurized product transfers its heat to a circulating water medium which in turn warms the raw milk. Pasteurized milk must be cooled before bottling, and, conversely, the raw milk, which has been kept cold during transit and storage, must be heated for pasteurization. Hence heat exchange by means of regenerators permits a substantial saving in heating and refrigeration costs.

Such equipment is of concern to health officers because of the danger of contamination of the pasteurized product by the raw milk in case flaws develop in the metal or the joints separating the two. Raw milk must be considered a potential source of pathogenic bacteria. Much of the value of pasteurization is lost if the product subsequent to pasteurization is subjected to possible contamination by raw milk. To combat this danger, control regulations frequently include provisions similar to the following, quoted from the Public Health Service Milk Ordinance and Code (Public Health Bulletin No. 220, 1936 edition, p. 101):

> Regenerative heater-coolers shall be so constructed and operated that, in the case of milk-to-milk regenerators, the pasteurized milk will at all times, including shut-down periods, be kept under higher pressure than the raw milk, and, in the case of milk-to-water-to-milk regenerators, the heat-transfer medium will at all times, including shut-down periods, be kept under higher pressure than the raw milk.

In the case of milk-to-water-to-milk equipment the intent of such a requirement is to prevent the raw milk from contaminating the heat-transfer medium, which in turn could contaminate the pasteurized product. The heat-transfer water, for which a potable supply must be used and which is confined in a closed circuit and is periodically reheated by the pasteurized milk, will not contaminate the latter unless such medium has first been mixed with raw milk. The pasteurized product could also be properly protected by requiring that it be kept at all times under higher pressure than the heat-transfer water, but this alternative method would not prevent the objectionable fouling of the water by the raw milk if flaws developed in the metal or the joints between them.

The methods for securing compliance with such a regulation are of a technical nature. The explanation accompanying this regulation in the Public Health Service Milk Code suggests certain procedures, but more recent study has demonstrated their inadequacy. It is the purpose of this paper, therefore, to fill the need for such detailed objective specifications as will enable control officials to determine readily whether the relative-pressure requirements are satisfied in the various types of regenerator hook-ups.

PRESSURE GAGES

Relative pressures may obviously be determined by means of pressure gages, or a differential pressure gage, or other pressure-indicating devices.

When gages are employed they should be located at the critical-pressure points of the regenerator, i. e., (1) at the raw-milk inlet, and (2) either at the pasteurized-milk outlet in the case of milk-to-milk regenerators, or at the heat-transfer-medium outlet from the raw-milk section in the case of milk-to-water-to-milk types. Counter-current flow is practically universally used in regenerators because of its greater heat-exchange efficiency. With counter-current flow, points (1) and (2) are always at the elevation where the pressure on the pasteurized-milk (or the heat-transfer-medium) side, if greater than that on the raw-milk side, exceeds the latter by the least amount. This is true for all types of regenerators, with either or both sides closed to the atmosphere, at all times while milk is in the regenerator, irrespective of whether the raw milk enters at the top or the bottom. For any side open to the atmosphere, a pressure gage is, of course, unnecessary.

Pressure-indicating devices will not indicate compliance or noncompliance with the relative-pressure requirement between inspections. Pressure-recording devices would overcome this objection by furnishing the inspector with a graphic history of the pressures. Aside from their high cost, such gages are likely to be none too sensitive or reliable at the relatively low pressure differentials ordinarily encountered in milk regenerators. A difference of an inch or two in gravity head between the two sides of a regenerator, which might be sufficient to reverse the pressure relationship during shut-downs, would not be indicated or recorded by the type of gages suitable for milk equipment. Gages would have to be tested for accuracy and sensitivity at frequent intervals. The pressure relationship would have to be determined for every rearrangement of the hook-up, every change in the pumping rate, and every change in equipment and size of piping. But the most serious objection to the use of pressure gages lies in the fact that the health officer would be powerless to remedy any damage that might have resulted from improper relative pressures occurring between inspections.

For these reasons pressure-indicating or recording devices are not recommended and should not be relied upon for determining compliance with the regulation. Instead, control officials should demand hook-ups like the following, which automatically insure the required relative pressures at all times.

MILK-TO-MILK REGENERATORS

Four types of milk-to-milk regenerators are possible. In the most common design both the raw milk and the pasteurized product flow through either a series of connected plates or two concentric pipes, so that both sides are closed to the atmosphere. In others the pasteurized milk is on the inside of a pipe, while the raw milk flows downward on the outside open to the atmosphere. The third design is like the second, but the raw milk is on the inside and the pasteurized on the outside. In the fourth possible type, not used at present, the raw milk flows downward on one side of a corrugated partition and the pasteurized on the other side, with both sides open to atmospheric pressure.

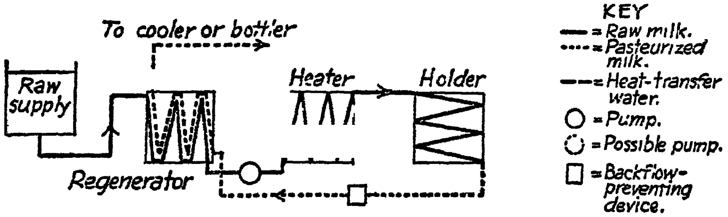

FIGURE 1.—Milk-to-milk regenerator with both sides closed to atmosphere (diagrammatic elevation).

On *milk-to-milk regenerators with both sides closed to the atmosphere* (fig. 1) the required relative pressures will be automatically insured when the following conditions obtain:

(*a*) The pasteurized milk, between its outlet from the regenerator and its nearest downstream point open to the atmosphere, rises to an elevation higher, by at least 3 percent of the static raw-milk head on the bottom of the regenerator, than any raw milk downstream from the free raw-milk level nearest upstream from the regenerator, provided that such excess head is at least 6 percent if water or chlorine solution precedes the milk at the beginning of a run; and

(*b*) No pump is located between the pasteurized-milk outlet from the regenerator and the nearest downstream point open to the atmosphere; and

(*c*) No pump is located between the raw-milk inlet to the regenerator and the free raw-milk level nearest upstream therefrom; and

(*d*) A backflow-preventing device, such as a positive-type pump or a check valve, is installed in the line between the pasteurized-milk inlet to the regenerator and either the nearest upstream point open to the atmosphere or the raw-milk outlet from the regenerator, whichever is farther downstream; provided that if said valve or pump or any portion of the system downstream therefrom leaks, storage for the pasteurized milk shall be provided downstream from its outlet from the regenerator and at the elevation specified in (*a*), either in the pipe line or in a tank equipped with a bottom inlet, equal in volume to at least one hour's leakage; and

(*e*) Hot water or chlorine solution or previously pasteurized milk is pumped through the system until it reaches the elevation specified in (*a*) before any raw milk is admitted to the regenerator.

The reasons for these specifications may not be apparent. If (*a*) is satisfied all pasteurized milk in the regenerator will be under greater pressure than the raw milk, provided (*b*) and (*c*) are satisfied during operation, (*d*) during shut-downs, and (*e*) at the beginning of the run.

The 3 percent excess head provided in (*a*) is intended to compensate, during shut-downs, for the difference in specific gravity between pasteurized milk at 160° F. or more and raw milk at 40° F. or less. Similarly, the 6 percent excess head required when water or chlorine solution precedes the milk at the beginning of a run serves to compensate, during shut-downs occurring at the beginning of a run, for the difference in specific gravity between water at 160° F. or more and milk at 40° F. or less.

A pump located as described in (*b*) could during operation reduce the pasteurized-milk pressure on its suction side to below that of the raw milk in the regenerator.

When the raw milk is sucked through the regenerator, an auxiliary pump provided with slip is sometimes located as described in (*c*), in order to overcome priming difficulties in the main pump and to maintain the raw milk in the regenerator at or above atmospheric pressure so as to avoid sucking in air. A raw-milk supply tank with its milk level higher than the regenerator at the beginning of the run would overcome priming difficulties, and placing the entire tank higher than the regenerator would attain both objectives, thus eliminating the need for an auxiliary pump. A raw-milk pump upstream from the regenerator could increase the raw-milk pressure to above that of the pasteurized milk in the regenerator during operation even if (*a*) and (*b*) were satisfied. It is possible to avoid this objection by placing in the pasteurized-milk line downstream from the regenerator a sufficient gravity head or pressure-increasing restriction, as by means of a valve. Whether such gravity head or restriction is sufficient to accomplish its purpose would have to be determined for each installation and for every change in the hook-up by means of pressure gages. Proper relative pressures could not be automatically insured.

The positive-type pump or the check valve specified in (*d*) will prevent backflow of the pasteurized milk through the regenerator, provided no leakage occurs. A flow-diversion valve cannot be relied upon to prevent backflow during the first few minutes following a pump shut-down while the milk is still at a sufficiently high temperature to keep the diversion valve in the forward-flow position. Backflow would lower the level of the pasteurized milk during pump shut-downs and thus might reduce its pressure to below that of the raw milk in the regenerator. The first alternative location for the device applies to systems with pasteurizer-holders or other intermediate tanks open to the atmosphere; the second, to completely closed systems. The second provision of (*d*) will insure an adequate pasteurized-milk pressure throughout a shut-down of at least 1 hour's duration, even if there is some backflow due to leakage. Shut-downs of such duration are infrequent. The adequacy of the storage provided to compensate for leakage should be checked occasionally by determining, by means of a petcock installed in the line, a sterile probe, or otherwise, whether the pasteurized milk in the line has fallen below the level specified in (*a*) after a pump shut-down of 1 hour.

At the beginning of a run the raw milk in the regenerator may be under greater pressure than the pasteurized-milk side from the time the raw milk enters the regenerator until the pasteurized milk has risen to the elevation specified in (*a*) downstream from and above the regenerator. The procedure described in (*e*) will overcome this danger. Water or previously pasteurized milk preceding the milk will temporarily provide the necessary pressure on the pasteurized-milk side until replaced by the freshly pasteurized milk.

On *milk-to-milk regenerators with only the raw milk open to the atmosphere* (fig. 2) the required relative pressures are automatically insured when

(*a*) The pasteurized milk, between its outlet from the regenerator and its nearest downstream point open to the atmosphere, rises higher than the top of the regenerator; and (*b*) No pump is located between the pasteurized-milk outlet from the regenerator and the nearest downstream point open to the atmosphere; and

(*c*) A backflow-preventing device, such as a positive-type pump or a check valve, is installed in the line between the pasteurized-milk inlet to the regenerator and either the nearest upstream point open to the atmosphere or the raw-milk outlet from the regenerator, whichever is farther downstream; provided that if said valve or pump or any portion of the system downstream therefrom leaks, storage for the pasteurized milk shall be provided downstream from its outlet from the regenerator, either in the pipe line or in a tank equipped with a bottom inlet, at a higher elevation than the top of the regenerator, equal in volume to at least 1 hour's leakage; and

(*d*) Hot water or chlorine solution or previously pasteurized milk is pumped through the system until it reaches the elevation specified in (*a*) before any raw milk is admitted to the regenerator.

The reasons for these specifications are similar to those for the preceding type. In both designs the purpose is to maintain the pasteurized product under greater pressure than the raw at all times, the only difference being that where the raw milk is open to the atmosphere the pasteurized milk need be kept only above atmospheric pressure rather than at a higher level than all raw milk in the system. If (*a*) is complied with all pasteurized milk in the regenerator will be under greater pressure than atmospheric, provided (*b*) is satisfied during operation, (*c*) during shut-downs, and (*d*) at the beginning of the run. In this type there is no objection to a raw-milk pump upstream from the regenerator, since the raw-milk side is open to the atmosphere and cannot be above atmospheric pressure.

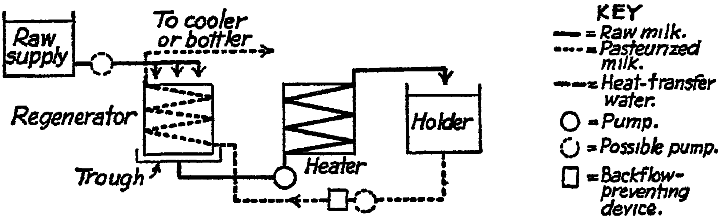

FIGURE 2.—Milk-to-milk regenerator with only raw milk open to atmosphere (diagrammatic elevation)

Milk-to-milk regenerators with only the pasteurized milk open to the atmosphere (fig. 3) should not be approved, since no conditions are apparent which will insure that all of the raw milk in the regenerator will be maintained at subatmospheric pressure (i. e., at lower pressure than the pasteurized milk) throughout a shut-down.

Even with a raw-supply tank below the bottom of the regenerator and no pump between the two, any air sucked into the line between the raw-milk inlet to the regenerator and the pump nearest downstream therefrom could, during a shut-down, soon destroy the suction and increase up to atmospheric (or even above atmospheric in plate-type regenerators) the pressure on the raw-milk side of the regenerator.

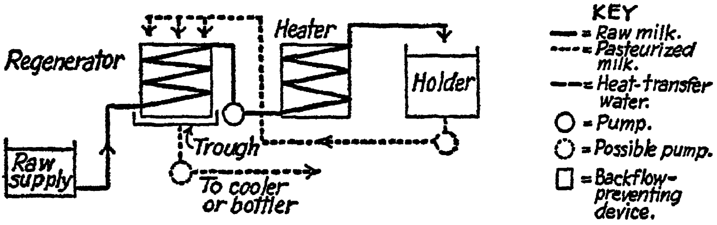

FIGURE 3.—Milk-to-milk regenerator with only pasteurized milk open to atmosphere (diagrammatic elevation).

Milk-to-milk regenerators with both sides open to the atmosphere (fig. 4) should not be approved, since with both sides at atmospheric pressure the pasteurized-milk side cannot ever be under greater pressure than the raw-milk side. This type of regenerator is not, however, being used nor is it likely to be used because of its inefficiency. It is subject to large heat losses to the atmosphere, and as the raw milk and the pasteurized milk must both flow downward it cannot utilize counter-current flow.

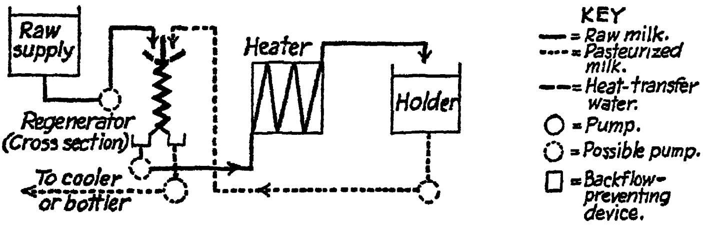

FIGURE 4.—Milk-to-milk regenerator with both sides open to atmosphere (diagrammatic elevation).

MILK-TO-WATER-TO-MILK REGENERATORS

Many types of milk-to-water-to-milk regenerators could be designed, but only the two types on the market will be discussed. The number of possible combinations may be gaged by the fact that in either or both the raw-milk and the pasteurized-milk sections both the milk and the heat-transfer medium may be either open or closed to the atmosphere. In connection with the relative-pressure requirement, conditions existing in the pasteurized-milk section are immaterial and only the raw-milk section need be considered.

On milk-to-water-to-milk regenerators with both the milk and the heat-transfer water in the raw-milk section closed to the atmosphere (fig. 5) the required relative pressures are automatically insured if—

(*a*) The highest point of the heat-transfer-water circuit is in a covered tank at an elevation higher, by at least 6 percent of the static raw-milk head on the bottom of the regenerator, than any raw milk downstream from the free raw-milk level nearest upstream from the regenerator; and

(*b*) No heat-transfer-water pump is located upstream from such tank but downstream from the heat-transfer-water inlet to the raw-milk section of the regenerator; and

(*c*) No milk pump is located between the raw-milk inlet to the regenerator and the free raw-milk level nearest upstream therefrom; and

(*d*) The heat-transfer-water circuit is full of water at the beginning of the run, and all loss of water from the circuit (through backsiphonage, open drain valve, leakage, evaporation, etc.) is prevented or automatically and immediately replenished whenever raw milk is present in the regenerator.

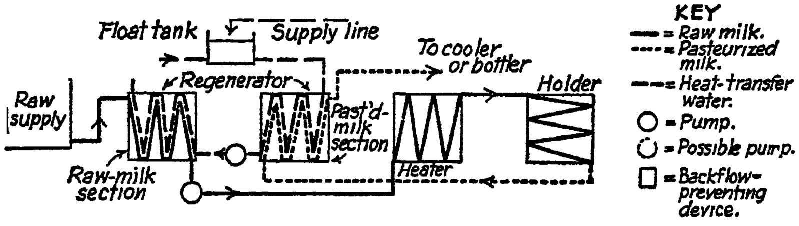

FIGURE 5—Milk-to-water-to-milk regenerator with both milk and water in raw-milk section closed to atmosphere (diagrammatic elevation)

Most of these requirements and the reasons therefor are similar to those already discussed for milk-to-milk regenerators with both sides closed to the atmosphere. Compliance with (*a*) will place all of the heat-transfer water in the raw-milk section of the regenerator under greater pressure than the raw milk at all times, provided (*b*), (*c*), and (*d*) are also satisfied. The excess head specified in (*a*) for the heat-transfer-water circuit will compensate, during shutdowns, for the difference in specific gravity between milk at 40° F. or less and water at 160° F. or more.

A heat-transfer-medium pump located as described in (*b*) could, when operating, reduce the heat-transfer-water pressure on its suction side to below that of the raw milk in the regenerator. A milk pump located as shown in (*c*) could during operation increase the raw-milk pressure to above that of the heat-transfer water in the regenerator even if all other requirements were satisfied.

The full heat-transfer-water circuit required at all times by (*d*) is considered the simplest means of insuring proper relative pressures. The heat-transfer-water pump could, when operating, satisfy the pressure requirement even if the circuit were not full; but when not operating it will not satisfy this requirement unless there is enough water in the circuit to fill the upstream portion between the pump and the tank, and unless all backflow and loss of water from this portion of the circuit are prevented. The most practical solution is, therefore, a constant-level tank at the highest point specified in (*a*). A covered tank will protect the water against contamination, but the cover should not be airtight. Although the float in the tank will automatically open the supply-line valve whenever any loss of water from the circuit occurs, the drain valve should be kept closed throughout the day's run to avoid unnecessary risks. The tank should be supplied with an overflow, and all supply lines feeding the heat-transfer-water circuit should enter at the tank and through a sufficient air gap to prevent loss of water through backsiphonage into the supply line.

On *milk-to-water-to-milk regenerators with the water closed but the milk open to the atmosphere in the raw-milk section* (fig. 6) the required relative pressures are automatically insured when the following conditions are satisfied:

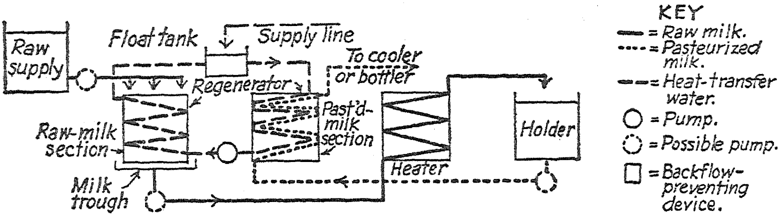

FIGURE 6.—Milk-to-water-to-milk regenerator with water closed but milk open to atmosphere in raw-milk section (diagrammatic elevation).

(*a*) The highest point of the heat-transfer-water circuit is in a covered tank at a higher elevation than the top of the raw-milk section of the regenerator; and

(*b*) No heat-transfer-water pump is located upstream from such tank but downstream from the heat-transfer-water inlet to the raw-milk section of the regenerator; and

(*c*) The heat-transfer-water circuit is full of water at the beginning of the run, and all loss of water from the circuit (through backsiphonage, open drain valve, leakage, evaporation, etc.) is prevented or automatically and immediately replenished whenever raw milk is present in the regenerator.

These specifications and the reasons therefor are almost identical with those of the type immediately preceding, except that the raw-milk pump upstream from the regenerator is not prohibited since the raw-milk pressure in this type of regenerator cannot exceed atmospheric.

ACKNOWLEDGMENTS

The valuable aid of Senior Sanitary Engineer L. C. Frank and Assistant Public Health Engineer W. N. Dashiell in reviewing the manuscript and suggesting revisions is appreciated.

SUMMARY

Milk regenerators, in which the hot pasteurized milk heats and is cooled by the cold raw milk either directly or through an intermediate water circuit, may permit contamination of the pasteurized product by the raw milk in case flaws develop in the metal or the joints separating the two. To combat this danger, control regulations usually require that the pasteurized milk (or the heat-transfer water) be under greater pressure at all times than the raw milk.

Objective criteria are presented to enable control officials to determine whether such regulations are satisfied. Methods are described for automatically insuring the required relative pressures in various types of milk-to-milk and milk-to-water-to-milk regenerators.

THE EFFECT OF CERTAIN SMALL FILTERS ON PLATE COUNTS OF WATER PASSING THROUGH THEM

By Arthur B. Cronkright, *Project Supervisor*,[1] and Arthur P. Miller, *Sanitary Engineer, United States Public Health Service*

From April 6, 1936, to June 30, 1937, the Public Health Service served as sponsor for Works Progress Administration project No. 265–6910, having as its aim the inspection of plumbing in Federal buildings in New York City and Detroit to detect hazards to the public health. In the course of this work in New York City, certain piping arrangements and fixtures were found which required study beyond that which would be given under the normal routine of the project. In this category was a group of small stone filters used to clarify water supplied to bottle-type water coolers situated in various buildings. The results of the special work done on these filters is here described.

For ready identification, the filters will be referred to by letter, as *A*, *B*, etc. Of the eight filters considered here, the first five (*A–E*) were connected to the same source of drinking water, and the other three (*F–H*) to another one. Filters *A–E* were identical and filters *F–H* were slightly larger than those in the first group (*A–E*).

The procedure followed in this work was very simple. It consisted of taking a sample of water from the line leading into the filter and then, at once, a second sample at the filter outlet. On filters

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[1] Formerly project supervisor, Works Progress Administration.

F, *G*, and *H*, the control samples from the influent were secured at the nearest fixture to the filters, namely, a slop sink situated about 6 feet ahead of the filters on the same pipe line. All samples were collected by trained personnel in accordance with good sampling technique and were tested within 2 hours after collection to determine the number of bacteria per milliliter growing on nutrient agar at 37° C. for 24 hours, by the procedures outlined in Standard Methods of Water Analysis of the American Public Health Association (8th edition, 1936), in the laboratory connected with the project and under the direction of a qualified bacteriologist.

TABLE 1.—*Averages of bacteria counts per milliliter for each filter*

Filter	Number of samples from each filter	Influent	Effluent	Percent increase	Filter	Number of samples from each filter	Influent	Effluent	Percent increase
A[1]	2	24	2,070	8,560	*E*[2]	10	45	101	125
B	9	9	3,154	34,900	*F*	5	8	1,052	13,100
C	9	20	611	2,950	*G*	5	8	22	175
D	10	288	55	−81	*H*	5	8	26	225

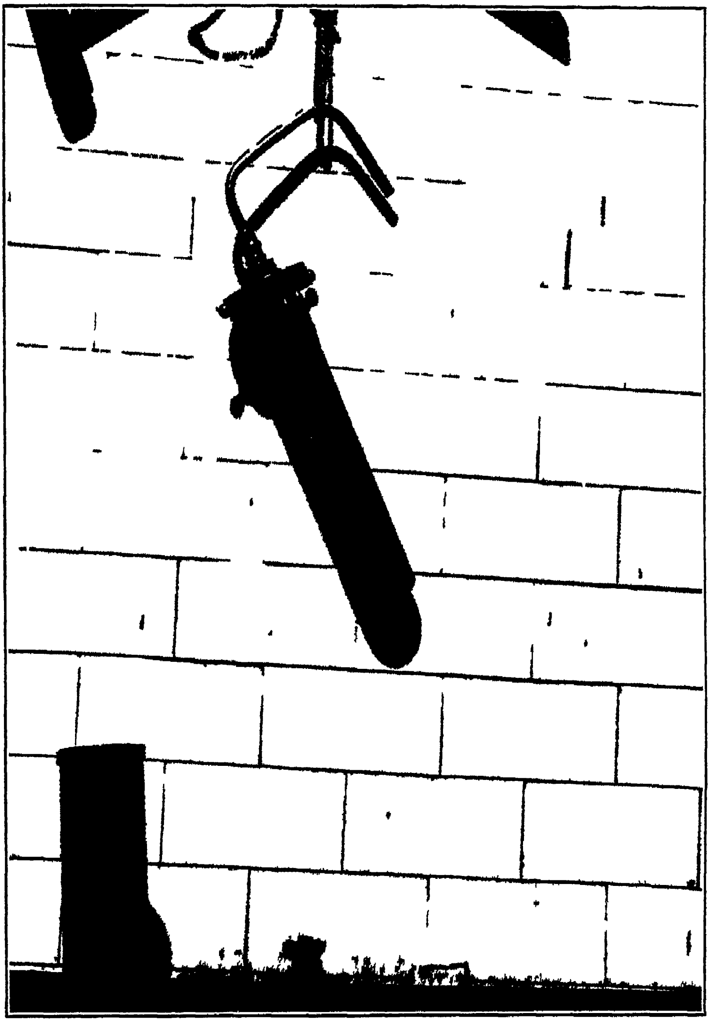
[1] This filter was removed after the second test.

[2] Tests of scrapings from this filter gave a count of 2,300,000 bacteria per milliliter growing on agar at 37° C. for 24 hours.

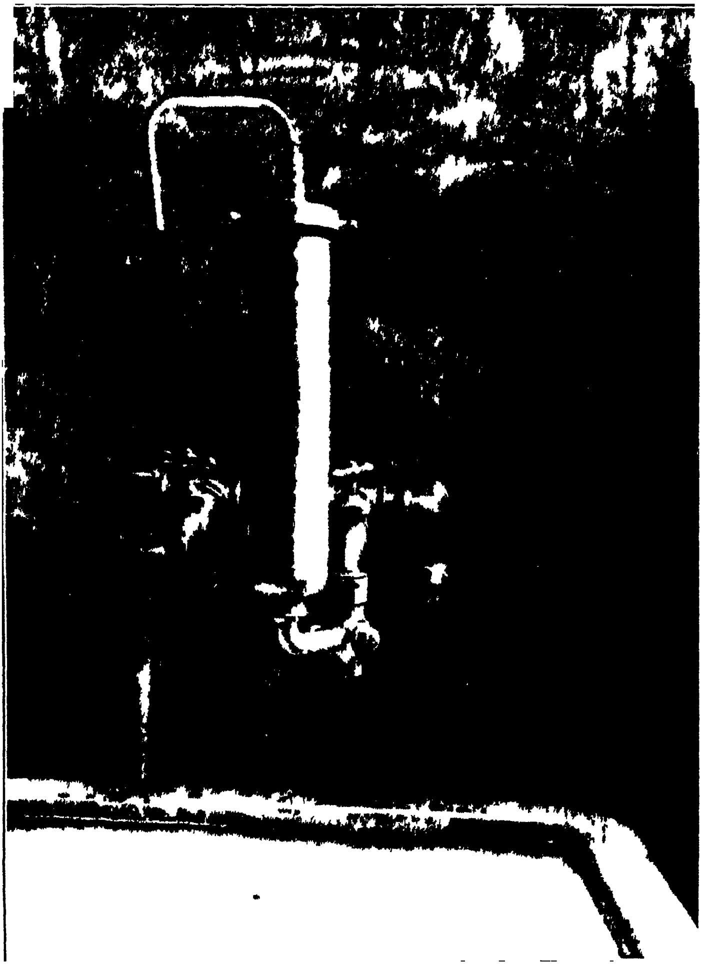
In some cases where effluent plates were crowded with colonies, due to counts being much higher than anticipated, estimates based on partial counts were made. The results on filter *D* do not parallel those on the other filters, on account of a single high influent count. Because of the small number of samples taken, this single result has an unmerited influence on this average. Excluding this one sample, the average count for the influent on this filter would have been 9 bacteria per milliliter. For every filter except *D*, the average results on the effluent are higher than those on samples of the influent. Excluding the high sample heretofore mentioned, the average for *D* effluent would be 58 bacteria per milliliter as opposed to 9 in the influent, or an increase of 544 percent. One sample of scrapings from the stone in filter *E* was taken. The resultant number of bacteria per milliliter growing on agar at 37° C. for 24 hours was 2,300,000.

Water passing through these filter stones leaves most of its undissolved substances on the stones' surface. These substances, apparently, are organic in nature as well as inorganic and provide any included bacteria with an abundant food supply. Multiplication takes place, and, eventually, if the stone is not replaced or cleaned, it becomes completely impregnated with bacteria. After that condition is reached, the filter stone gives off to the water passing through it more bacteria than it removes. The percentages of increase in the number of bacteria in the effluent as shown in table 1 adequately confirm this opinion.

PLATE I



Photograph showing dirty condition of stone in filter C



Filter D

SUMMARY

Bacteriological examinations of samples of drinking water taken before and after filtering through a certain type of stone filter in several public buildings in New York City show that these filters very measurably increase the plate counts of water passing through them under the operating conditions obtaining in those buildings at the time of sampling.

DEATHS DURING WEEK ENDED MARCH 12, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Mar. 12, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	9,057	9,557
Average for 3 prior years	9,608	
Total deaths, first 10 weeks of year	89,544	104,715
Deaths under 1 year of age	559	606
Average for 3 prior years	629	
Deaths under 1 year of age, first 10 weeks of year	5,406	6,407
Data from industrial insurance companies:		
Policies in force	69,759,312	69,403,932
Number of death claims	13,837	15,595
Death claims per 1,000 policies in force, annual rate	10.3	11.7
Death claims per 1,000 policies, first 10 weeks of year, annual rate	10.1	11.6

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (------) indicate that cases or deaths may have occurred although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Mar. 19, 1938, and Mar. 20, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937
New England States:								
Maine	1	2	4	113	202	28	0	2
New Hampshire	0	0	------	------	18	50	0	0
Vermont	1	0	------	------	136	1	0	0
Massachusetts	3	5	------	------	290	864	1	4
Rhode Island	0	1	5	------	9	482	0	1
Connecticut	8	5	3	18	28	658	0	0
Middle Atlantic States:								
New York	34	56	[1] 10	[1] 47	2, 293	703	3	14
New Jersey	11	14	25	19	1, 401	2, 987	1	4
Pennsylvania	42	34	------	------	6, 104	322	5	13
East North Central States:								
Ohio	20	24	------	48	1, 777	252	1	11
Indiana	38	12	17	85	1, 062	60	4	3
Illinois	19	45	14	77	6, 382	70	2	8
Michigan [2]	8	13	1	3	5, 185	62	0	3
Wisconsin	2	0	40	67	4, 959	23	1	2
West North Central States:								
Minnesota	2	5	------	2	62	24	0	0
Iowa	3	3	8	6	133	3	2	1
Missouri	16	15	67	253	1, 178	13	1	2
North Dakota	3	2	68	4	28	1	2	0
South Dakota	0	0	2	------	------	2	0	0
Nebraska	1	2	------	4	46	5	1	0
Kansas	3	9	22	40	537	13	0	2
South Atlantic States:								
Delaware	3	0	------	9	32	48	0	0
Maryland [3]	10	8	10	45	97	877	0	4
District of Columbia	7	3	4	2	11	59	0	3
Virginia	24	24	------	------	841	120	3	15
West Virginia	10	9	56	229	483	20	1	12
North Carolina	20	9	24	248	3, 254	167	1	1
South Carolina [3]	5	5	242	1, 508	316	41	0	5
Georgia [3]	14	5	------	779	483	------	3	2
Florida	66	8	3	14	858	5	3	14
East South Central States:								
Kentucky	13	12	10	119	982	110	6	12
Tennessee [3]	8	12	67	522	998	34	5	13
Alabama	7	8	121	1, 874	1, 104	14	13	19
Mississippi [3]	3	4	------	------	------	------	0	1

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Mar. 19, 1938, and Mar. 20, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937
West South Central States:								
Arkansas	6	0	98	211	272		2	0
Louisiana[3]	12	18	7	88	5	21	0	20
Oklahoma[4]	6	10	182	287	126	12	1	5
Texas[3]	35	29	511	1,677	128	476	1	8
Mountain States:								
Montana	3	1		25	5	18	0	0
Idaho	0	0	2	4	4	13	0	0
Wyoming	1	0			29	1	0	0
Colorado	12	8			580	4	0	1
New Mexico	9	1	7	33	70	110	0	1
Arizona	1	2	130	30	26	195	0	0
Utah[4]	0	1			439	23	0	0
Pacific States:								
Washington	4	1	7		9	39	0	2
Oregon[5]	1	0	72	51	31	19	0	2
California	30	25	44	311	609	206	3	5
Total	525	450	1,883	8,552	13,622	9,246	66	215
First 11 weeks of year	6,852	5,956	31,577	244,532	330,311	61,922	1,009	1,843

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938
New England States:									
Maine	0	0	28	26	0	0	2	0	69
New Hampshire	0	0	7	21	0	0	0	0	
Vermont	0	0	10	8	0	0	0	0	42
Massachusetts	0	0	359	287	0	0	0	4	145
Rhode Island	0	0	10	67	0	0	0	0	22
Connecticut	0	0	130	167	0	0	0	0	61
Middle Atlantic States:									
New York	3	1	1,017	1,052	0	4	3	4	404
New Jersey	0	0	167	239	0	0	1	1	163
Pennsylvania	1	0	514	785	0	0	6	1	223
East North Central States:									
Ohio	1	4	317	308	13	1	1	6	82
Indiana	0	1	166	204	48	5	2	0	38
Illinois	1	2	601	874	35	21	3	10	91
Michigan[2]	0	0	596	828	19	0	8	6	228
Wisconsin	0	0	172	407	4	7	1	4	140
West North Central States:									
Minnesota	0	0	135	160	20	9	1	0	27
Iowa	0	0	285	322	36	25	1	0	23
Missouri	0	0	250	456	54	76	2	3	57
North Dakota	0	0	29	30	13	17	0	0	29
South Dakota	0	0	16	48	6	0	0	0	19
Nebraska	0	0	25	106	8	11	0	0	6
Kansas	0	0	189	442	14	59	1	1	136
South Atlantic States:									
Delaware	0	0	27	6	0	0	1	0	10
Maryland[2]	0	0	109	47	0	0	0	2	70
District of Columbia	0	0	18	17	0	0	0	1	11
Virginia	3	1	50	17	0	0	2	3	80
West Virginia	0	0	68	39	0	0	2	11	53
North Carolina	0	1	41	40	1	1	2	1	473
South Carolina[3]	0	0	1	6	0	1	1	4	56
Georgia[3]	0	1	11	22	6	0	6	2	104
Florida	0	0	6	10	1	0	2	3	7

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Mar. 19, 1938, and Mar. 20, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938	Week ended Mar. 20, 1937	Week ended Mar. 19, 1938
East South Central States:									
Kentucky	0	0	100	46	19	0	2	6	37
Tennessee [3]	1	1	55	24	4	0	2	1	53
Alabama	1	0	15	10	0	0	4	1	31
Mississippi [2]	1	0	3	6	3	0	1	1	--------
West South Central States:									
Arkansas	1	0	10	10	5	2	7	1	23
Louisiana [3]	0	1	11	13	3	4	33	4	20
Oklahoma [4]	1	1	27	--------	14	15	0	4	64
Texas [3]	0	1	96	125	23	5	15	14	312
Mountain States:									
Montana	0	0	21	35	9	20	0	2	60
Idaho	0	0	22	40	17	2	0	1	28
Wyoming	0	0	10	40	0	0	0	0	3
Colorado	1	0	57	67	8	4	1	1	13
New Mexico	0	1	33	22	0	0	2	3	51
Arizona	0	0	5	16	14	0	2	0	20
Utah [2]	0	0	47	35	1	0	0	0	38
Pacific States:									
Washington	1	0	47	35	43	10	2	2	188
Oregon [5]	0	1	55	39	29	38	2	0	28
California	6	0	239	236	44	18	8	4	523
Total	22	17	6,205	7,900	514	355	129	112	4,364
First 11 weeks of year	238	228	67,405	73,363	6,198	3,297	1,302	1,213	44,995

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[1] New York City only.

[2] Period ended earlier than Saturday.

[3] Typhus fever, week ended Mar. 19, 1938, 15 cases, as follows: South Carolina, 1; Georgia, 10; Tennessee, 1; Louisiana, 1; Texas, 2.

[4] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

[5] Rocky Mountain spotted fever, week ended Mar. 19, 1937, Oregon, 1 case.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
February 1938										
Alabama	22	56	1,196	44	2,827	24	2	67	3	14
Colorado	2	51	9	--------	1,547	--------	1	204	32	2
Georgia	6	43	650	100	3,098	31	2	58	2	13
Idaho	1	2	29	--------	9	--------	3	78	99	3
Illinois	8	133	126	13	23,375	--------	2	2,871	151	23
Massachusetts	8	11	--------	1	811	--------	0	1,213	0	5
Michigan	9	69	7	--------	10,480	--------	4	2,303	51	51
Minnesota	5	13	11	--------	153	--------	1	671	95	1
Mississippi	5	36	8,023	1,035	1,426	216	9	31	17	3
Missouri	9	79	693	7	4,335	2	3	819	157	18
New Mexico	2	16	19	1	409	1	2	98	0	17
New York	32	137	--------	6	4,102	--------	2	3,030	0	17
North Carolina	11	105	123	20	7,966	15	4	172	4	12
North Dakota	2	4	15	--------	58	--------	0	122	74	0
Ohio	17	113	105	--------	8,148	--------	1	1,469	123	11
Oregon	4	14	209	--------	74	--------	3	288	88	2
Tennessee	15	48	593	5	3,500	8	1	168	55	6

Summary of monthly reports from States—Continued

February 1938

	Cases
Anthrax:	
Massachusetts	1
Ohio	2
Chickenpox:	
Alabama	323
Colorado	324
Georgia	366
Idaho	126
Illinois	2,252
Massachusetts	1,608
Michigan	2,051
Minnesota	606
Mississippi	1,553
Missouri	359
New Mexico	130
New York	3,058
North Carolina	1,022
North Dakota	167
Ohio	2,283
Oregon	338
Tennessee	247
Conjunctivitis:	
Georgia	5
Idaho	3
New Mexico	2
Dengue:	
Mississippi	3
Diarrhea:	
Ohio (under 2 years; enteritis included)	19
Dysentery:	
Georgia (amoebic)	4
Georgia (bacillary)	9
Illinois (amoebic)	3
Illinois (amoebic carriers)	11
Illinois (bacillary)	15
Massachusetts (bacillary)	6
Michigan (amoebic)	6
Minnesota (amoebic)	10
Mississippi (amoebic)	86
Mississippi (bacillary)	185
Missouri (amoebic)	1
New Mexico (amoebic)	1
New Mexico (bacillary)	1
New York (amoebic)	3
New York (bacillary)	52
Ohio (amoebic)	1
Ohio (bacillary)	2
Tennessee (amoebic)	2
Tennessee (bacillary)	4
Encephalitis, epidemic or lethargic:	
Alabama	3
Illinois	4
Michigan	3
Missouri	4
New Mexico	1
New York	13
Oregon	1
German measles:	
Alabama	51
Idaho	8
Illinois	191
Massachusetts	80
Michigan	225
New Mexico	5
New York	140
North Carolina	31
North Dakota	63
Ohio	39
Tennessee	8
Hookworm disease:	
Georgia	3,181
Mississippi	580
Impetigo contagiosa:	
Illinois	24
Oregon	70
Tennessee	1
Jaundice, infectious:	
Michigan	1
Oregon	4
Lead poisoning:	
Ohio	5
Mumps:	
Alabama	14[illegible]
Colorado	33
Georgia	211
Idaho	237
Illinois	1,044
Massachusetts	777
Michigan	1,603
Mississippi	377
Missouri	318
New Mexico	55
North Dakota	6
Ohio	697
Oregon	66
Tennessee	230
Ophthalmia neonatorum:	
Illinois	3
Massachusetts	94
Mississippi	6
New York[1]	9
North Carolina	1
Ohio	67
Tennessee	3
Paratyphoid fever:	
Idaho	1
Illinois	1
Massachusetts	1
Michigan	1
New York	2
North Carolina	2
Puerperal septicemia:	
Mississippi	26
New Mexico	2
Ohio	1
Rabies in animals:	
Alabama	63
Illinois	30
Massachusetts	9
Michigan	8
Mississippi	22
Missouri	9
New Mexico	1
New York[1]	5
Oregon	6
Scabies:	
Oregon	82
Septic sore throat:	
Georgia	50
Idaho	40
Illinois	12
Massachusetts	21
Michigan	30
Minnesota	9
Missouri	45
New Mexico	9
New York	172
North Carolina	16
Ohio	113
Oregon	12
Tennessee	13
Tetanus:	
Alabama	3
Georgia	1
Illinois	1
Michigan	1
Missouri	1
New York	1
Trachoma:	
Idaho	2
Illinois	49
Missouri	35
Tennessee	1
Trichinosis:	
Massachusetts	4
Michigan	3
New York	18
Ohio	7
Tularaemia:	
Alabama	2
Georgia	10
Illinois	4
Minnesota	1
Missouri	3
North Carolina	1
North Dakota	1
Ohio	2
Typhus fever:	
Alabama	10
Georgia	26
New York	2
North Carolina	1
Undulant fever:	
Alabama	3
Georgia	4
Idaho	2
Illinois	7
Massachusetts	3
Michigan	15
Minnesota	2
Mississippi	4
New Mexico	1
New York	8
North Carolina	2
Ohio	7
Oregon	4
Tennessee	1
Vincent's infection:	
Idaho	1
Illinois	8
Michigan	18
New York[1]	122
North Carolina	1
North Dakota	11
Oregon	20
Tennessee	3
Whooping cough:	
Alabama	83
Colorado	41
Georgia	223
Idaho	53
Illinois	367
Massachusetts	451
Michigan	737
Minnesota	147
Mississippi	878
Missouri	375
New Mexico	146
New York	1,797
North Carolina	1,371
North Dakota	124
Ohio	492
Oregon	124
Tennessee	224

[1] Exclusive of New York City.

WEEKLY REPORTS FROM CITIES

City reports for week ended Mar. 12, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	195	703	130	6,264	980	2,569	25	409	19	1,336	--------
Current week [1]	168	128	52	15,830	726	1,943	33	429	16	1,199	--------
Maine:											
Portland	0	------	0	3	4	0	0	0	0	23	21
New Hampshire:											
Concord	0	------	0	1	1	0	0	2	0	5	13
Manchester	0	------	2	2	2	3	0	2	0	0	19
Nashua	0	------	0	0	1	0	0	0	0	0	9
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	2
Burlington	0	------	0	9	0	1	0	0	0	4	9
Rutland	0	------	0	0	0	0	0	0	0	0	8
Massachusetts:											
Boston	0	------	0	128	20	110	0	5	0	23	234
Fall River	0	------	0	0	0	0	0	1	0	6	30
Springfield	0	------	0	3	7	0	0	1	0	18	42
Worcester	0	------	0	8	6	25	0	3	0	4	63
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	13
Providence	20	------	0	2	12	0	0	0	0	28	68
Connecticut:											
Bridgeport	0	------	0	0	2	24	0	2	0	0	37
Hartford	0	------	0	3	3	24	0	2	1	1	51
New Haven	0	3	0	2	4	1	0	0	0	9	30
New York:											
Buffalo	0	------	1	4	0	43	0	12	0	18	169
New York	30	10	8	862	154	387	0	82	4	208	1,622
Rochester	0	2	0	3	4	19	0	1	0	6	66
Syracuse	0	------	0	26	6	7	0	2	0	9	72
New Jersey:											
Camden	1	1	1	40	3	5	0	3	0	1	28
Newark	0	------	0	10	11	12	0	5	0	32	133
Trenton	0	1	0	2	4	8	0	2	0	4	30
Pennsylvania:											
Philadelphia	10	12	5	759	43	129	0	17	1	41	537
Pittsburgh	4	3	1	347	19	39	0	6	1	15	156
Reading	0	------	0	4	1	2	0	0	0	6	17
Scranton	1	------	--------	54	-------	7	0	-------	0	4	--------
Ohio:											
Cincinnati	1	2	1	1	8	19	0	7	0	11	147
Cleveland	1	18	0	351	13	76	0	10	2	52	180
Columbus	1	2	2	220	9	7	0	5	0	0	99
Toledo	0	------	0	105	5	16	1	3	0	29	68
Indiana:											
Anderson	0	------	0	51	0	3	1	0	0	2	10
Fort Wayne	0	------	0	106	0	17	1	1	0	3	31
Indianapolis	7	------	3	186	20	17	0	5	0	11	122
Muncie	0	------	0	0	3	0	0	3	0	0	17
South Bend	0	------	0	23	0	2	1	1	0	0	6
Terre Haute	0	------	0	25	0	5	2	0	0	0	13
Illinois.											
Alton	1	------	0	0	2	2	0	0	0	0	7
Chicago	8	3	2	3,478	50	246	1	37	2	46	702
Elgin	1	------	0	2	2	8	0	0	0	2	15
Moline	0	------	0	40	2	14	0	0	0	0	10
Springfield	0	------	0	286	0	7	0	0	0	2	16
Michigan:											
Detroit	9	1	1	3,027	8	188	0	15	0	77	247
Flint	1	------	0	5	7	52	0	1	0	28	27
Grand Rapids	0	------	0	66	3	13	0	0	0	3	31
Wisconsin:											
Kenosha	0	------	0	17	0	3	0	0	0	0	7
Madison	0	------	0	15	0	4	0	0	0	8	28
Milwaukee	1	------	0	3,679	8	24	1	3	0	25	120
Racine	0	------	0	39	0	14	0	0	0	13	15
Superior	0	------	0	8	3	1	0	0	0	0	11

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[1] Figures for Wilmington, N. C., estimated; report not received.

City reports for week ended Mar. 12, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0		0	0	1	2	0	1	0	4	18
Minneapolis	0		2	20	7	32	3	2	0	3	96
St. Paul	0	3	3	2	4	13	3	1	0	2	65
Iowa:											
Cedar Rapids	0			0		3	1		0	1	
Davenport	0			3		0	0		0	0	
Des Moines	0			2		27	1		0	0	41
Sioux City	0			0		3	0		0	0	
Waterloo	0			40		7	0		0	0	
Missouri:											
Kansas City	1	1	2	261	14	19	0	4	0	4	102
St. Joseph	1		0	47	3	0	0	0	0	0	25
St. Louis	8		0	21	13	109	0	7	0	8	225
North Dakota:											
Fargo	0		0	0	0	0	0	0	0	11	4
Grand Forks	0			3		2	0		0	0	
Minot	0		0	0	0	2	9	0	0	0	4
South Dakota:											
Aberdeen	0			0		1	0		0	5	
Sioux Falls	0			0		0	0		0	0	10
Nebraska:											
Omaha	0		0	7	9	4	0	1	0	1	65
Kansas:											
Lawrence	0	3	0	0	0	0	0	0	0	0	6
Topeka	0		1	15	1	2	0	0	0	20	20
Wichita	0		0	0	2	1	0	1	0	4	28
Delaware:											
Wilmington	0		0	14	6	2	0	1	0	1	37
Maryland:											
Baltimore	4	9	3	12	22	39	0	7	0	33	211
Cumberland	0		0	3	0	5	0	1	0	4	14
Frederick	0		0	0	0	0	0	1	0	0	5
Dist. of Col.:											
Washington	9		0	12	20	24	0	8	0	5	175
Virginia:											
Lynchburg	0		0	1	1	1	0	0	0	2	13
Norfolk	0		0	73	1	11	0	0	0	5	18
Richmond	0		1	18	2	3	0	4	0	0	62
Roanoke	1		0	0	1	2	0	0	0	0	14
West Virginia:											
Charleston	1	3	1	60	5	2	0	0	1	2	28
Huntington	1			30		1	0		0	0	
Wheeling	0		0	110	2	8	0	0	0	9	21
North Carolina:											
Gastonia	0			9		0	0		0	9	
Raleigh	0		0	50	0	0	0	0	0	20	10
Wilmington											
Winston-Salem	2		0	3	2	0	0	1	0	35	12
South Carolina:											
Charleston	0	22	0	25	4	0	0	0	0	0	23
Florence	0		0	10	4	1	0	0	0	0	9
Greenville	0		0	1	2	1	0	1	0	11	24
Georgia:											
Atlanta	0	6	0	132	12	5	1	8	0	7	106
Brunswick	0		0	0	1	0	0	0	0	0	5
Savannah	1		0	34	3	0	0	1	0	0	28
Florida:											
Miami	0		0	61	5	2	0	3	0	6	36
Tampa	2	1	1	6	3	2	0	1	0	0	26
Kentucky:											
Ashland	0		0	1	0	0	0	0	0	0	0
Covington	0		0	0	0	0	0	1	0	4	14
Lexington	0		0	0	3	0	0	1	0	0	18
Louisville	4	5	0	254	11	50	0	5	0	8	96
Tennessee:											
Knoxville	1	10	2	54	2	2	0	2	0	1	33
Memphis	0		3	63	10	2	0	8	1	1	95
Nashville	0		4	160	7	3	0	5	0	6	62
Alabama:											
Birmingham	1	2	4	190	8	1	0	3	0	1	74
Mobile	0		2	25	4	0	0	3	0	1	28
Montgomery	0	1	0	81		0	0		0	2	
Arkansas:											
Fort Smith	0			13		0	0		0	0	
Little Rock	0		0	55	2	1	0	1	0	0	

City reports for week ended Mar. 12, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0		0	1	1	0	1	0	0	3	5
New Orleans	1	6	0	0	7	11	0	12	0	14	134
Shreveport	1		0	11	10	0	0	2	2	0	37
Oklahoma:											
Muskogee	0			0		0	0		0	0	
Oklahoma City	1		0	0	7	5	0	3	0	0	59
Tulsa	2			15		3	9		0	8	
Texas:											
Dallas	3	1	1	2	7	13	0	3	0	3	68
Fort Worth	1		1	3	4	6	0	2	0	6	45
Galveston	0		0	0	2	0	0	1	0	0	17
Houston	1	1	0	3	15	4	0	6	1	0	100
San Antonio	19		0	0	12	1	0	8	0	0	64
Montana:											
Billings	0		0	1	1	0	0	1	0	1	11
Great Falls	0		0	1	3	2	3	0	0	5	14
Helena	0		0	1	1	0	0	0	0	0	4
Missoula	0		0	0	0	0	0	0	0	0	4
Idaho:											
Boise	0		0	0	0	1	2	0	0	0	8
Colorado:											
Colorado Springs	0		0	1	0	7	0	0	0	1	9
Denver	4		2	486	9	20	0	4	0	2	95
Pueblo	0		0	0	3	5	1	0	0	5	13
New Mexico:											
Albuquerque	1		1	7	1	0	0	3	0	1	20
Utah:											
Salt Lake City	0		0	178	5	12	0	1	0	6	45
Washington:											
Seattle	1		3	2	3	5	0	1	0	57	96
Spokane	0		0	1	4	1	0	1	0	23	41
Tacoma	0		0	0	2	8	1	1	0	24	28
Oregon:											
Salem	0	2		0		0	1		1	0	
California:											
Los Angeles	10	13	0	13	25	47	4	18	0	9	411
Sacramento	0		0	6	5	1	0	3	0	50	26
San Francisco	3	2	0	1	7	13	0	10	0	65	189

State and city	Meningococcus meningitis		Poliomyelitis cases	State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Rhode Island:				District of Columbia:			
Providence	1	0	0	Washington	0	1	0
New York:				Georgia:			
Buffalo	4	2	0	Savannah	1	1	0
New York	3	0	2	Kentucky:			
New Jersey:				Louisville	0	1	0
Newark	1	1	0	Tennessee:			
Ohio:				Nashville	0	1	0
Cincinnati	2	2	0	Louisiana:			
Illinois:				New Orleans	4	0	0
Chicago	1	0	0	California:			
Missouri:				Sacramento	1	0	0
Kansas City	1	1	0	San Francisco	1	0	0
St. Louis	1	0	0				
Maryland:							
Baltimore	1	0	0				

Encephalitis, epidemic or lethargic.—Cases: New York, 3; Cleveland, 1; Detroit, 1; Milwaukee, 2; Baltimore, 1.
Pellagra.—Cases: Atlanta, 2; Birmingham, 4; Dallas, 1; San Antonio, 1; San Francisco, 1.
Smallpox.—Deaths: Superior, 1.
Typhus fever.—Cases: New York, 1.

FOREIGN AND INSULAR

CHINA

Shanghai—Cerebrospinal meningitis.—During the week ended March 12, 1938, 47 cases of cerebrospinal meningitis with 8 deaths were reported in two foreign settlements of Shanghai, China.

CUBA

Provinces—Notifiable diseases—4 weeks ended February 5, 1938.—During the 4 weeks ended February 5, 1938, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	1		1	7		3	12
Chickenpox	4	4		1	1		10
Diphtheria	4	16	3	5	3		31
Hookworm disease		56					56
Leprosy						6	6
Malaria	14	11	12	77	7	150	271
Measles	23	35	7			6	71
Poliomyelitis	1	1	1			2	5
Tetanus, infantile				1			1
Tuberculosis	32	33	28	50	49	35	227
Typhoid fever	11	60	2	34	4	35	146
Whooping cough		16		16			32
Yaws						5	5

GERMANY

Hamburg—Elmshorn—Psittacosis.—During the period December 11, 1937, to the end of February 1938, 14 cases of psittacosis with 2 deaths were reported in Elmshorn and Hamburg, Germany. It was stated that the local board of health had reported infected parrakeets to have been traced to Elmshorn, a small town near Hamburg, and to bird dealers in Hamburg and Schleswig-Holstein.

ITALY

Communicable diseases—4 weeks ended January 2, 1938.—During the 4 weeks ended January 2, 1938, cases of certain communicable diseases were reported in Italy as follows:

Disease	Dec. 6-12	Dec. 13-19	Dec. 20-26	Dec. 27, 1937-Jan. 2, 1938
Anthrax	23	12	4	21
Cerebrospinal meningitis	14	14	15	13
Chickenpox	365	465	351	253
Diphtheria	817	826	750	663
Dysentery	28	51	21	26
Hookworm disease	5	9	5	7
Lethargic encephalitis	4	2	1	1
Measles	1,292	1,873	1,257	1,438
Mumps	202	224	178	121
Paratyphoid fever	75	64	54	44
Poliomyelitis	22	29	23	17
Puerperal fever	41	58	29	42
Scarlet fever	328	296	290	225
Typhoid fever	462	474	402	312
Undulant fever	25	29	33	42
Whooping cough	288	265	181	187

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for March 25, 1938, pages 470-483. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

India—Bassein.—During the week ended March 12, 1938, 1 fatal case of cholera was reported in Bassein, India.

Plague

Belgian Congo.—On March 15, 1938, 1 case of plague was reported in Kwandruma, and 3 cases of plague were reported in Lisasi, Belgian Congo.

Ecuador—Chimborazo Province—Chimbo.—During the week ended March 5, 1938, 10 cases of plague were reported in Chimbo, Chimborazo Province, Ecuador.

Hawaii Territory—Island of Hawaii—Hamakua District—Paauhau Sector.—A rat found on March 9, 1938, in Paauhau Sector, Hamakua District, Island of Hawaii, Hawaii Territory, has been proved positive for plague.

Peru.—During the month of January 1938, plague was reported in Peru as follows: Lambayeque Department, 1 case, 1 death; Lima Department, 6 cases, 5 deaths.

Smallpox

British North Borneo—Sandakan.—During the week ended February 12, 1938, 1 case of smallpox was reported in Sandakan British North Borneo

Great Britain—England and Wales.—During the week ended March 5, 1938, 1 case of smallpox was reported in Leighton Buzzard, and 1 case in Bedford County, England.

On vessel—City of Auckland.—On March 5, 1938, 1 case of smallpox was reported on the *S. S. City of Auckland* at Halifax, Nova Scotia. The vessel sailed from Calcutta on January 18, 1938. The report stated that all precautionary measures had been taken.

Typhus Fever

Mexico.—During the month of January 1938, typhus fever was reported in Mexico as follows: Aguascalientes, Aguascalientes State, 13 cases, 1 death; Mexico State, 8 cases, 1 death; Mexico, D. F., 27 cases, 5 deaths, Oaxaca State, 1 case; San Luis Potosi, San Luis Potosi State, 5 cases, 4 deaths.

Yellow Fever

Brazil.—Yellow fever has been reported in Brazil as follows: Federal District, February 17, 1 death; February 28, 1 death. Minas Geraes State—January 30 to March 1, 53 deaths Rio de Janeiro State—January 28 to February 21, 6 cases, 8 deaths. Sao Paulo State—Presidente Wenceslau, January 1938, 14 cases.

Ivory Coast—Agboville.—On March 12, 1938, 1 suspected case of yellow fever was reported in Agboville, Ivory Coast.

Nigeria—Ijebuode.—During the week ended January 29, 1938, 1 suspected case of yellow fever with 1 death was reported in Ijebuode, Nigeria.

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UNITED STATES TREASURY DEPARTMENT

PUBLIC HEALTH REPORTS

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IN THIS ISSUE

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Variations in Form and Services of Public Health Organizations
Gas Absorption Apparatus Rapidly Tests Large Volumes of Air
Tenth Pan American Sanitary Conference at Bogotá, Colombia

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UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg. Gen. ROBERT OLESEN, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

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PUBLIC HEALTH REPORTS

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DISABLING SICKNESS AMONG MALE INDUSTRIAL EMPLOYEES DURING THE FINAL QUARTER OF 1937 AND THE ENTIRE YEAR[1]

By WILLIAM M. GAFAFER, *Senior Statistician*, and ELIZABETH S. FRASIER, *Junior Statistician, United States Public Health Service*

The data presented are those of reporting industrial sick benefit organizations located principally in the New England, Middle Atlantic, and North Central States. The record covers the same 26 companies in 1937 as in 1936. The rates are based on the experience of male workers only and include only those disabilities of over one week's duration. A later report covering a larger number of organizations giving the sickness incidence rates and time-lost rates for the three years, 1935–1937, inclusive, will include the experience of female employees.

The year 1937.—For the year 1937 as a whole, the frequency of cases of sickness and nonindustrial injuries causing disability for 8 calendar days or longer in a group of 185,044 industrial employees was 99.7 cases per 1,000 men. This is the highest annual rate since 1929. It exceeded the rate for 1936 (90.9) by approximately 10 percent, and the rate for the 5 preceding years (87.6) by 14 percent. (See table 1.)

With the exception of tuberculosis of the respiratory system, all the subgroups of respiratory diseases in 1937 exceeded the rates for 1936 as well as those for the 5-year period under consideration. Tuberculosis of the respiratory system occurred at similar rates in 1937 and 1936.

The nonrespiratory diseases as a group also showed increases. Within this group of diseases an increase in the rates for diseases of the stomach except cancer, diarrhea and enteritis, appendicitis, diseases of the skin, infectious and parasitic diseases, and ill-defined and unknown causes appears to have taken place in 1937 and 1936 as compared with the 5-year period 1932–36.

The fourth quarter of 1937.—Among 187,891 men covered in the record for the fourth quarter of 1937, the rate, 84.7 cases per 1,000 men, for all sickness and nonindustrial injuries was somewhat lower than that for the same quarter of 1936 (87.0 cases per 1,000 men).

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[1] From the Division of Industrial Hygiene of the National Institute of Health, United States Public Health Service, Washington, D. C. The report for the third quarter and the first nine months of 1937 was published in the PUBLIC HEALTH REPORTS for January 14, 1938 (*53:* 37–39).

The frequency of respiratory diseases in the fourth quarter of 1937 was 12 percent lower than in the final quarter of the preceding year. However, the rate for pneumonia (3.0 cases per 1,000) was 36 percent greater than that for the same quarter of 1936 (2.2 cases per 1,000).

Nonrespiratory diseases occurred at a slightly greater frequency than in the final quarter of 1936. With the exception of diseases of the stomach (cancer excepted), diarrhea and enteritis, appendicitis, diseases of the heart and arteries, and nephritis, and other genitourinary diseases, which showed greater frequency in the fourth quarter of 1937 than in the corresponding quarter of 1936, the rates for the nonrespiratory diseases in the fourth quarter were approximately the same or lower than the corresponding rates for the same period of 1936.

The quarter-years of 1933–37, inclusive.—The disability rates by quarter-years for the period 1933–37 are shown in table 2, and graphically in figure 1. It is apparent from figure 1A that there was an epidemic of respiratory diseases in the first quarter of 1937. Of interest is the gradually increasing trend of the rates for the respiratory diseases; with the exception of the peak in the first quarter of 1933 all succeeding corresponding peaks are on a gradually increasing trend. These phenomena are reflected in the graph representing the rates for all disabilities.

The time changes in the rates for nonrespiratory diseases and nonindustrial accidents, respectively, show approximately level trends. With respect to nonrespiratory diseases the lowest quarterly rate in each year appears to be in the fourth quarter, with no definite peaks at equally spaced intervals of time. The nonindustrial rates, on the other hand, show a definite peak generally in the third quarter of each year.

Figure 1B has been prepared to show for each of the 5 years the seasonal variation of the frequency of the total disabilities and the disabilities occasioned by the respiratory diseases. Both groups of graphs, with the epidemic of 1937 clearly in evidence, show the well-known general behavior of respiratory disease incidence.[3] No ordering of all of the years is possible because of the crossing and recrossing of the yearly curves. However, it is of interest to observe that 1933 is consistently below 1937 with respect to both total disabilities and the respiratory diseases.

Figure 1C shows the time changes of each of the 4 quarters for total disabilities and the respiratory diseases, respectively. As anticipated previously, in both groups of graphs there are indications of increasing

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[3] Compare, Doull, J. A., Herman, N. B., and Gafafer, W. M.: Minor respiratory diseases in a selected adult group; prevalence, 1928–32, and clinical characteristics as observed in 1929–30. Am. J. Hyg., 17: 536–561 (1933).

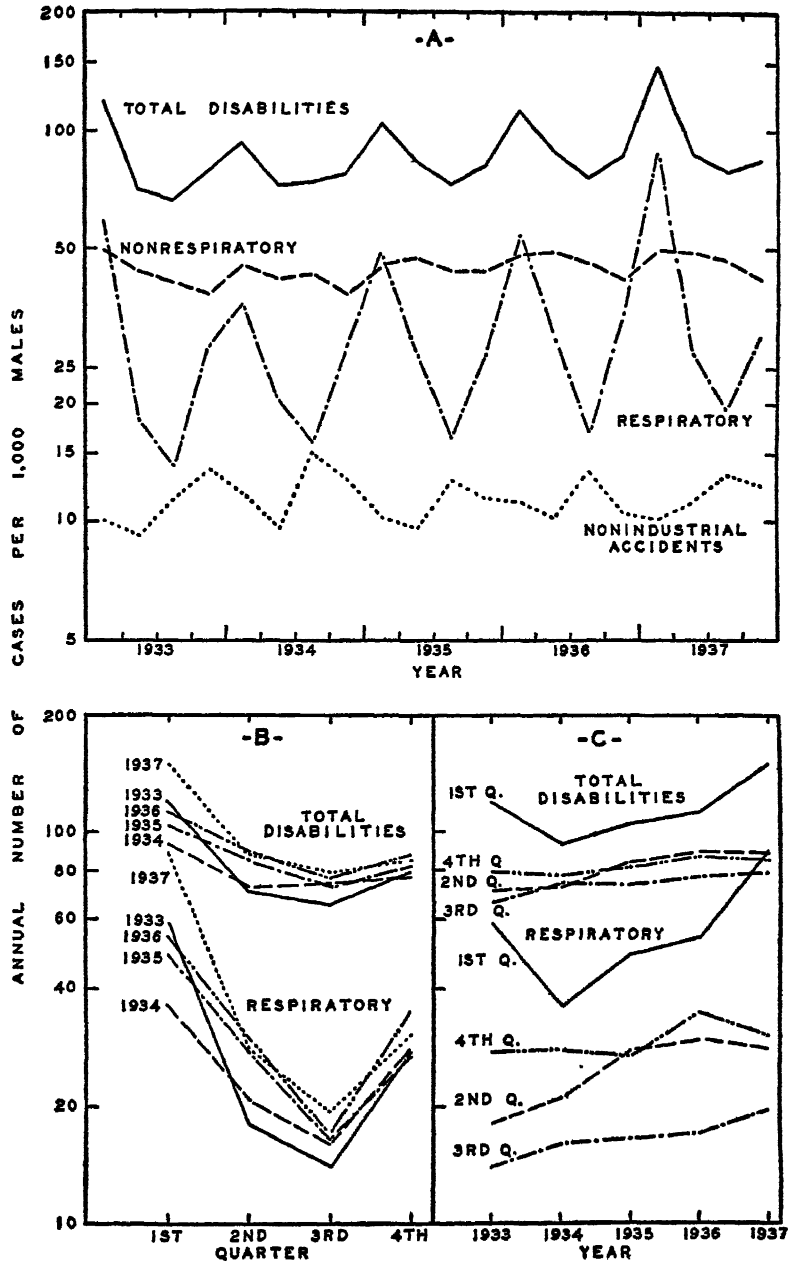

FIGURE 1.—Frequency (logarithmic) of disability lasting 8 calendar days or longer caused by respiratory diseases, nonrespiratory diseases, and nonindustrial accidents by quarter-year of onset, 1933-37; (A) quarterly variation from 1933 through 1937, (B) quarterly variation for each of the years 1933-37 with the years superimposed, and (C) variation from 1933 through 1937 with the quarters superimposed (Male morbidity experience of industrial companies which reported their cases to the United States Public Health Service.)

trends of incidence with time, the first quarter in each instance being quite isolated and, with respect to position, above the remaining quarters. It will be observed that the 1937 epidemic of respiratory diseases was of sufficient magnitude to draw the graph of the respiratory diseases of the first quarter up, and over the graphs of the total disabilities for the second, third, and fourth quarters, respectively. Of interest also is the position of the graph of the respiratory diseases for the third quarter; this particular graph is isolated, shows an increasing trend with time and, with respect to position, is the lowest of all quarters.

TABLE 1.—*Frequency of disability lasting 8 calendar days or longer in the fourth quarter of 1937 compared with the same quarter of 1936, and the year 1937 as compared with preceding years (male morbidity experience of industrial companies which reported their cases to the U. S. Public Health Service)*[1]

Diseases and disease groups which caused disability. (Numbers in parentheses are disease title numbers from the International List of the Causes of Death, fourth revision, Paris, 1929)	Annual number of disabilities per 1,000 men in—				
	Fourth quarter of—		Full year of—		
	1937	1936	1937	1936	5 years 1932–36
Sickness and nonindustrial injuries [2]	84.7	87.0	99.7	90.9	87.6
Nonindustrial injuries	12.3	10.6	11.7	11.5	11.8
Sickness [2]	72.4	76.4	88.0	79.4	75.8
Respiratory diseases	30.2	31.5	40.5	33.3	30.8
Bronchitis, acute and chronic (106)	4.4	5.0	4.9	4.9	3.7
Diseases of the pharynx and tonsils (115a)	4.7	4.1	5.0	4.7	4.5
Influenza and grippe (11)	11.5	15.7	20.1	15.0	15.0
Pneumonia, all forms (107–109)	3.0	2.2	4.0	2.6	2.1
Tuberculosis of the respiratory system (23)	.7	.7	.8	.8	.9
Other respiratory diseases (104, 105, 110-114)	5.9	6.8	5.7	5.3	4.6
Nonrespiratory diseases	42.2	41.9	47.5	46.1	45.0
Diseases of the stomach, cancer excepted (117–118)	4.1	3.5	4.0	3.7	3.6
Diarrhea and enteritis (120)	1.1	.9	1.4	1.3	1.2
Appendicitis (121)	4.0	3.6	4.5	4.2	3.8
Hernia (122a)	1.4	1.5	1.6	1.7	1.6
Other digestive diseases (115b, 116, 122b–129)	2.4	2.4	2.5	2.8	2.9
Rheumatic group, total	8.8	8.7	9.2	9.7	9.7
Rheumatism, acute and chronic (56, 57)	3.3	3.6	4.0	4.2	4.5
Diseases of the organs of locomotion (156b)	3.2	3.3	3.0	3.3	3.0
Neuralgia, neuritis, sciatica (87a)	2.3	1.8	2.2	2.2	2.2
Neurasthenia and the like (part of 87b)	1.0	1.0	1.1	1.1	1.0
Other diseases of the nervous system (78–85, part of 87b)	1.0	1.0	1.0	1.1	1.3
Diseases of the heart and arteries and nephritis (90–99, 102, 130–132)	3.9	3.4	4.1	3.7	3.8
Other genito-urinary diseases (133–138)	2.3	2.1	2.3	2.3	2.4
Diseases of the skin (151–153)	3.0	3.3	3.1	3.0	2.7
Infectious and parasitic diseases except influenza (1–10, 12–22, 24–33, 36–44)	1.3	1.7	2.7	2.3	2.4
Ill-defined and unknown causes (200)	2.0	3.2	3.2	2.9	2.2
All other diseases (45–55, 58–77, 88, 80, 100, 101, 103, 154–156a, 157, 162)	5.9	5.6	6.8	6.3	6.4
Average number of males covered in the record	187,891	167,298	185,044	157,159	146,574
Number of companies	26	26	26	26	------

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[1] In 1937 and 1936 the same companies are included, the rates for the fourth quarters of the years 1932 to 1936 include 26 of these companies, which employed an average of approximately 80 percent of the 146,574 men representing the sample population for the 5-year average

[2] Exclusive of disability from the venereal diseases and a few numerically unimportant causes of disability.

TABLE 2.—*Frequency of disability lasting 8 calendar days or longer by quarter-years, 1933–37, inclusive (male morbidity experience of industrial companies which reported their cases to the U. S. Public Health Service)*

Year and quarter in which disability began	Annual number of cases per 1,000 men				Average number of males covered
	Total. sickness and nonindustrial accidents	Respiratory diseases	Nonrespiratory diseases	Nonindustrial accidents	
1933					
First	118.2	58.7	49.4	10.1	134,788
Second	70.7	17.9	43.6	9 2	132,847
Third	66.3	14.0	40 8	11.5	149,657
Fourth	79.4	27.5	38.3	13.6	143,760
1934					
First	93.0	36.2	45.0	11.8	145,723
Second	72.8	20.9	42.3	9.6	158,873
Third	74.1	15.9	43.2	15.0	157,771
Fourth	78.3	27.7	37.8	12.8	153,194
1935					
First	104.0	48.6	45.2	10.2	138,234
Second	84.0	27.4	47.0	9.6	138,214
Third	73.5	16.6	44.1	12.8	140,627
Fourth	82.0	26.8	43.7	11.5	143,877
1936					
First	113.1	53.8	48.0	11.3	145,701
Second	89.0	29.7	49.0	10.3	150,248
Third	76.8	17.0	46.2	13.6	162,721
Fourth	87.0	34.5	41.9	10.6	167,298
1937					
First	148.1	88.5	49.4	10.2	173,617
Second	88.2	27.8	49.1	11.3	184,304
Third	79.4	19.4	46.7	13.3	188,327
Fourth	84.7	30.2	42.2	12.3	187,891

VARIATIONS IN THE FORM AND SERVICES OF PUBLIC HEALTH ORGANIZATIONS [1]

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Since a favorite defense of men and races is that self-preservation is the first law of life, one might logically assume the quest for health to be among the best organized of all earthly pursuits. We Americans do list public health among the first duties of state. In a way it is recognized that the term implies supervision by science and medicine over nature through the myriad units of the body politic, and it is rather widely, if somewhat vaguely, assumed that this is being done with what we are pleased to consider twentieth century enlightenment.

This generation has been host to a phenomenal development of techniques for controlling disease. The most spectacular, viewed through the change in death rates since the turn of the present century, are those which deal with the microorganisms. Our armory of means for dealing with even more elusive causes of disease is also expanding. One would expect full use of measures to combat diseases, the most potent of all forces for human destruction; yet public health activity, according to its best friends and severest critics, is far from being directed with the military precision worthy of the strength and strategy of the foe, and, in fact, is all too frequently but a lame and desultory substitute for a great offensive.

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[1] From the Division of Public Health Methods, National Institute of Health. Study conducted in connection with the National Health Inventory.

The United States Public Health Service has a series of data which, in the positive manner of statistics, back up the plaints of students of public health administration that activities in this field lack common direction, integration, and pattern. These data were gathered during the National Health Inventory conducted by the Public Health Service. They cover the health agencies, and thus a large fraction of the organized program for public health, of 94 counties.[2] These counties, most of which include large cities within their borders, contain approximately 25 percent of the population in the continental United States. It may be accepted that they represent a high average of public health development as compared with the country as a whole.

The indices used herein for showing variety in organization and dispersion of effort are the number of agencies, source and amount of financial support, composition of staff, and content of program. The data do not include items pertaining to hospitals and other facilities for care of the sick, material relief, water and sewerage systems, or scavenger services. They deal only with the assortment of agencies that would be named as representing the general set-up for improving health in these counties. The content and implications of a community health program are summarized by way of defining the problem toward which these agencies are directing their efforts.

Improvement of environment is now part and parcel of the public health program. Most commonly such program includes authority over the following activities: Purification of water; production, processing, and sale of foods; disposal of sewage and other wastes; and elimination of hazards in the home and places of employment. This work, when properly done, sums up to a large scale enterprise, not susceptible of organization on a small population base, and requires the knowledge and skill of an engineer. In its simplest form among small health departments it is set down as sanitary inspection and nuisance abatement.

The modern method for controlling communicable disease involves an intelligence service by which the diseases may be located promptly and an epidemiological service for tracing infection to its lair. Against a few diseases persons may be immunized; some communicable diseases are amenable to environmental control; prompt and adequate treatment of sick individuals often is the measure chosen; or quarantine, though not especially effective, still may be the only procedure available. The program as a whole requires that practically every public health technique be brought into play, and for success these are dependent in large measure on citizen support and participation. These diseases are related inextricably to the daily coming and going of individuals, and consequently their control should not be undertaken by an official whose authority is limited to civil districts that have little or no relation to the economic or social groupings of the population.

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[2] Services encompassed by this discussion are those regulatory and promotional measures which commonly comprise the programs of health departments, of school medical units, and of voluntary organizations with similar interests. Medical care for low-income groups, operation of hospitals, and services in the interest of municipal cleanliness are specifically excluded.

While some of the acute communicable diseases have receded as causes of sickness and death, the chronic diseases have slipped up to the front. If they are to be curbed, they must be recognized early and their victims given proper care—services that entail the employment of physicians, nurses, and laboratory technicians, as well as the utilization of hospital and clinic facilities.

The imparting of hygienic principles, as carried on today, combines the knowledge and art of the physician, nurse, and teacher and the full employment of the innumerable channels for disseminating information. Programs may be developed for all the people, or special emphasis may be placed on the health of mothers, children, or persons employed in industry. Obviously this is no part-time job for a person unacquainted with methods for influencing human behavior.

In short, it takes a complex organization to battle intelligently and effectively for the health of a people against the microscopic organisms and other forces bent on their destruction. To protect itself fully, a unit of population must have the means to support such an organization and must be of sufficient size to justify the employment of a staff representing the required techniques, thus making economy possible in the operation of the many services. For simplification of administrative problems, the unit of population served by the health agencies should be a social, political, and economic entity.

Public health organization, as it actually exists through the length and breadth of the land, is a gerrymander of jurisdictions and a potpourri of health agencies with all degrees and conditions of income, autonomy, and the will to do something. Its very nature rather defies the regularities of statistical delineation; nevertheless the 2,500 and some odd agencies contributing to this thesis have been distributed through five tables according to their jurisdictions, resources, and types of activity. The term "agency" is used elastically in this discussion to run the entire gamut of public health staffs, from large corps of trained personnel down to lone individuals working away at being a health department. Consequently, the activities covered vary immensely. They include those smartly in step with the latest scientific dictates and also the odd chores that comprise all the health work of some communities.

In table 1 the agencies are enumerated to show their strength in numbers without regard to the value of their separate contributions. A significant proportion of the figures represent the ex-officio health officer who steps into the role when chance demands it. This spare-time individual may tack up placards when measles or scarlet fever makes its rounds, or he may go over some evening and complain to a burgher that the neighbors find his backyard too odorous; but a consistent preventive campaign against disease is not within the scope of the local doctor or merchant or barber who takes time off occasionally for the job of health officer. In many instances "health officer" is but a title which some obliging individual consents to adopt so that the town charter may be fulfilled.

It will be noted in the same table that 1,037 of the agencies in the 94 counties reported on are nonofficial. Such organizations are a natural outgrowth of the assumption that public health is anybody's field, as indeed it is. If some dynamic woman gathers her friends about her for a crusade against a particular microbe or to promote some element of public hygiene, it would be churlish and without historical justification to gainsay her right to do so. This would be a meaner world if the instinct to alleviate distress had not flourished in the human heart through wars, plagues, and nature's upheavals. However, it is possible to give credit where credit is due and still to make the point that the public health set-up is inadequate, that the available efforts are not well marshaled, that for the most part each organization bites into the problem wherever its taste directs—in short, that from the standpoint of organization the set-up is behind the times. In earlier days individual good deeds comprised the major part of what was done for the common weal. The knowledge was less, and the means were home-made. A village woman carrying her household remedies across the commons exemplified in some respects what there was of public health work; the bucket brigade was the sum of fire-fighting activity. It is no reflection on those individuals who went to help out, nor on those who still go to help out, to recommend an efficient centralized organization to do in a more effective way and for many more people what is impossible for a friendly neighborhood to perform, no matter how good the intentions may be. But public health work has lagged behind. In many places it is still the bucket brigade, hardly aware of the new knowledge available and unequipped with the new weapons which changing times have developed.

TABLE 1.—*Distribution of agencies providing health services by counties in different population groups*

County population group	Number of counties	Total population	Number of agencies			Agencies per 100,000 population		
			Total	Official	Nonofficial	Total	Official	Nonofficial
All counties	94	33,978,479	2,565	1,528	1,037	7.5	4.5	3.0
Under 20,000	15	191,274	94	82	12	49.2	42.9	6.3
20,000-59,999	25	856,580	353	269	84	41.2	31.4	9.8
60,000-99,999	14	1,020,428	204	199	65	25.9	19.5	6.4
100,000-249,999	13	2,244,347	402	280	122	17.9	12.5	5.4
250,000-499,999	13	4,919,583	347	218	129	7.0	4.4	2.6
500,000 and over	14	24,746,267	1,105	480	625	4.4	1.9	2.5

In these 94 counties the public health picture is made up of 2,565 centers of authority, a picture that might lend itself very well to the impressionistic style of treatment. If some standard unit were accepted—say the county—from which all the activities diverged, a unit to act as a clearing house for all offers of help from those who can get money or services together, then it stands to reason that a more logical ratio of effort to total problem could be established.

In the discussion that follows, the number of agencies is related to population units of 100,000, in order that there may be a common denominator. By this distribution it will be seen that the smaller counties are more generously supplied than are the larger. The group under 20,000 has 49 agencies per 100,000 population, while the counties of half a million or more have only 4.4. The official agencies are especially numerous in proportion to the population of small counties, but there is a drop to the low figure of 2 per 100,000 population in the very large counties. The agency rate depends to a great extent on the number of civil units in a county. County A with 16 villages and 14 townships may have many health departments, while County B with one metropolis and 380 square miles of countryside may have but two—one for the city and one for the remainder of the county.

The objection, of course, is not to the number of agencies but to the attendant scattering of resources and the overlapping and duplication of effort that must result from an aggregation of autonomous organizations that work without common direction. Table 2 suggests the extent of this overlapping and the variation in administrative arrangements.

TABLE 2.—*Distribution of health agencies with different primary interests according to the political unit which forms the base of organization*

Primary interest of sponsoring agency	Number of agencies	Number of agencies serving specified political units			
		County	City	Other minor civil divisions	Special districts
Official	1,528	139	305	481	603
General health	1,079	84	199	379	417
Education	351	10	78	100	163
Welfare	64	26	16	1	21
Other	34	19	12	1	2
Nonofficial	1,037	225	540	105	167
General health	170	66	60	30	14
Special health programs	153	78	66	2	7
Welfare	327	30	206	15	76
Nursing	53	15	30	4	4
Education and recreation	166	17	73	53	23
Other	168	19	105	1	43

Among official agencies, health departments are in the majority, and they are followed by a significant number of hygiene units operating under educational auspices. Welfare agencies concerned with health are not numerous, but in some communities the welfare department administers most of the health service. The group designated as having "other" primary interests includes departments of public works with minor responsibilities in health, or perhaps a separate establishment in the government directing a program especially concerned with malaria control, rodent extermination, or the like.

The largest number of voluntary agencies in this particular picture for 94 of the counties in the United States give welfare as of primary importance, but to some degree this represents lack of definition concerning objective in statements on the schedule. Groups engaged in material relief, child protection, family rehabilitation, and similar welfare activities are likely to carry some health service as a side issue. If a worker finds the head of a family too sick to hold a job, her immediate objective will be to get the condition diagnosed and treated and to set the family provider on his feet again.

Those voluntary agencies whose first concern is education and recreation include study clubs, parent-teacher associations, the Y. M. C. A., the Y. W. C. A., luncheon clubs, and similar organizations. Their interest in health may be expressed in activities among members, moral support of community programs, or money grants for specific services. Business concerns, life insurance companies, and industries also may contribute to community health either directly or indirectly through services rendered their beneficiaries and employees.

The nonofficial agencies having health as a primary interest most frequently focus their effort on general measures for maternal and child health. Among specific disorders picked out for attack by voluntary agencies, tuberculosis leads and is followed in order of frequency by behavior problems of children, cancer, heart disease, and orthopedic defects. Nursing agencies, though not the most numerous among voluntary groups, have as a rule substantial budgets and are most tangible in purpose. Health instruction and bedside care of the sick constitute their chief activities.

A large number listed as "other" are not subject to exact classification. Neighborhood clubs of every conceivable designation and purpose make up this group. Many of these clubs are negligible, and their contributions to the cause die a-borning. Such associations of individuals, however, even though they may never get beyond the passing of resolutions, symbolize a deep-seated interest in the public health movement, and they often serve to keep burning the fires all but quenched in those political upheavals which occur among the ones entrusted officially with the public health work.

The jurisdictions most frequently served by official agencies are districts of special creation or those expressing varying combinations of pre-existing minor civil divisions (see table 2). Other frameworks for official health organizations are the towns, townships, villages, and similar lesser political units of the county. County government as an instrument of health administration was reported by 139 agencies. In few instances is this an over-all type of organization, as the local governments perform certain of the functions pertaining to health. Voluntary agencies, on the other hand, are organized most frequently on a city and, next, on a county basis. This point is especially significant, since it shows that people free of political restrictions tend to use population groupings that are best suited for the purpose.

As to the importance of the agencies, budget is probably the best single index. True, some may spend large sums on rather fruitless undertakings, while others accomplish much more through intelligent use of meager resources. These exceptional cases, however, do not invalidate comparisons made on a budgetary basis when large numbers of agencies are involved. The proportion of their budgets which agencies obtain from different sources reveals further the measure to which they may draw on their sponsors for financial support. In table 3 the agencies are compared on the basis of their budgets.

It will be seen from this table that public agencies as a group obtain practically their entire budget through appropriation of tax funds. Those operating under educational auspices received in the form of contributions an amount equivalent to about 1 percent of their combined funds. A somewhat larger amount from the same source was reported by the group having a general health interest, but the sum is of little moment in proportion to the total budget. The aggregate of fees listed for sponsoring agencies having interests designated as general health or "other," though small, perhaps deserves mention, since such fees represent in the main special taxes imposed for inspections, issuance of licenses, and similar functions of health and sanitation divisions in local governments.

TABLE 3.—*Distribution of income of health agencies with different primary interests according to source of income*

Primary interest of sponsoring agency	Number of agencies reporting income figures	Total income	Amount of income from specified sources		
			Taxation	Contributions	Fees for services
Official	1,330	$34,671,979	$34,337,637	$122,492	$211,850
General health	936	25,483,222	25,203,187	88,300	191,735
Education	312	2,331,973	2,304,752	24,969	2,252
Welfare	51	1,646,510	1,642,459	3,000	1,051
Other	31	5,210,274	5,187,239	6,223	16 812
Nonofficial	611	12,522,002	1,148,044	7,159,825	4,214,133
General health	113	2,436,655	75,981	1,165,300	1,195,374
Special health problems	125	2,236,604	236,976	1,713,315	286,313
Welfare	157	3,057,322	307,181	2,149,063	601,078
Nursing	51	3,262,420	303,705	1,581,961	1,376,754
Education and recreation	88	216,761	1,277	86,427	129,057
Other	77	1,312,240	222,924	463,759	625,557

The part taken by voluntary agencies in public health programs is strikingly illustrated in table 3. Their budgets in the aggregate represent slightly more than 25 percent of all funds expended for public health purposes included under this study. Some private agencies that render specific services on behalf of the local governments receive fairly substantial amounts from that source. Aside from such public grants, the two sources of funds for the nonofficial agencies are contributions and fees, the former by far the larger. Contributions rather than fees are typical of welfare agencies and those concerned with special disease problems. A nursing service, on the other hand, appears to be about 50 percent self-sustaining.

A point of special significance, not included in the table, is the failure of 12 percent of the official and 42 percent of the voluntary agencies to report any expenditure. In part this may have been an oversight, but the schedules for the majority of those failing to report expenditures do not indicate that any program entailing the spending of appreciable sums of money is being carried out. It is true, however, that unpaid workers may be rendering some service which does not show in table 3. These services may be as definite as the giving of actual bedside care, or as intangible as the shaping of public opinion, and are of course very difficult to measure.

Another point worthy of special note is that the average budget of the 611 voluntary agencies reporting funds is approximately $20,000, and the average for the 1,330 governmental agencies reporting operating budgets is only slightly higher, or $26,000. However, if the median be used to describe income, it is found to have a much lower value for governmental than for nongovernmental agencies. This is due to the fact that a large number of governmental agencies are represented by lone health officers who serve on a part-time basis for small salaries.

The voluntary agencies in the aggregate make substantial contributions to public health programs; but, like the official agencies, their efforts may be misdirected and their programs frequently lack substantial content because of inadequate financial backing. Thus the public health set-up, the principal organization for applying those measures which science and medicine have laboriously accumulated, is made up to a large degree of agencies that are inadequately financed, that depend on contributions for their livelihood, or that must receive fees in order to keep going. Table 3, then, throws the harsh light of "How much?" on the situation, and reveals a loose-jointed organization, often weak where a mere count of its members would indicate that it is strongest.

The character of a staff and its size are commonly accepted to be the most objective measure of public health organization. Full-time service especially is taken to be the best indication of professional interest by the staff. If these criteria are conceded to be valid, then one may say that public health organization in the counties studied, as depicted by table 4, presents a rather sad commentary on the devotion of organized society to human health. A situation wherein more than one-third of the agencies have budgets of less than $500 is considerably of a poser to those concerned about raising the level of health. This is true inadequate national defense, and it is against a foe that is not just meditating on coming over within the next 100 years but is actually within the borders. Furthermore, among this one-third are about 500 agencies that failed to report any funds whatsoever. Only one full-time person is employed by the entire group of those in the $500 or less budget class; and judging from the salary possible under such a budget, this person is not likely to possess high technical qualifications.

Nurses are listed by approximately one-half of the agencies whose budgets exceed $1,000. As one might expect, physicians are not found with any degree of regularity among those organizations with small budgets; in fact, they are seldom represented where budgets fall below $10,000. The ratio of one or more physicians per agency is attained only when annual sums in excess of $50,000 are at the command of the organization. Dentists likewise are associated with the larger units. Well over 90 percent of the full-time physicians and dentists are concentrated in about 18 percent of the agencies, and all of these have $10,000 or more in available funds. Sanitary inspectors are also found among the better financed agencies in particular.

Table 4.—*Number of full-time employees with specified qualifications in health agencies having different total annual budgets*

Value of budget		Number of agencies	Number of employees					
Range	Aggregate		Total	Physicians	Nurses	Inspectors	Dentists	Others
Total	$29, 335, 245	1, 861	12, 579	869	5, 799	1, 159	136	4, 616
Less than $500	96, 204	652	1	0	0	0	0	1
$500–$999	102, 239	146	18	0	6	1	0	11
$1,000–$1,999	288, 964	193	133	1	77	0	0	55
$2,000–$4,999	735, 242	230	242	12	157	7	3	63
$5,000–$9,999	895, 995	129	361	27	192	14	8	120
$10,000–$49,999	4, 425, 340	206	1, 749	86	925	79	20	630
$50,000–$99,999	2, 060, 862	31	847	46	319	69	28	385
$100,000 and over	20, 730, 399	52	9, 073	678	4, 017	973	67	3, 338
Unknown or none		222	155	19	106	16	1	13

The affairs of smaller organizations employing full-time persons are usually carried on by an individual included under "others" in table 4. Lay secretaries make up most of this group for the voluntary agencies, and sanitarians for the official agencies. The number of clerks and technicians increases with the size of the budget, although the budget as a rule attains considerable size before the technicians are added. Table 4, therefore, shows most succinctly that the blueprint of public health organization is likely to be much more impressive than the performance.

The next distribution of the data, table 5, shows the fields of activity in which agencies of the several types busy themselves. These data do not differentiate on the basis of intensity, nor the specific items pursued by the several agencies, but simply show the number of organizations accepting responsibility for particular jobs.

Some of the agencies failed to report programs. A limited number of these no doubt are doing a fairly substantial piece of work and simply overlooked this part of the schedule. Others may have felt that their efforts were desultory in character—valuable, but not the kind of thing to show up on a schedule. For the great majority, however, failure to report service may be accepted as signifying little or no activity. There were 109 official and 595 nonofficial agencies that failed to mention what they were doing—or 7 percent and over 50 percent, respectively. The governmental group that failed to record service includes the many health departments in name only referred to in table 1, departments manned by some obliging citizen who will take time off from his regular occupation to quarantine an infectious person or remove the carcass of a dog that failed to observe traffic regulations. The voluntary group that omitted accounts of service represent various associations that were set up to do something, but for one reason or another never got around to doing it. In many instances, however, the nonofficial agencies that failed to report service programs made money grants for services to be administered under other auspices.

The first impression given by table 5 is that there is no particular pattern in the distribution of responsibility for services, and in a large measure this is true. A fairly general low rate of participation by agencies in the several types of service clearly shows that very few organizations embrace even the limited field of public health work encompassed by the list of activities in table 5.

TABLE 5.—*Number and percentage of official and nonofficial health agencies providing selected types of service*

Type of service	Agencies of specified type[1] reporting services					
	All agencies		Official agencies		Nonofficial agencies	
	Number	Percent	Number	Percent	Number	Percent
Communicable disease control	1,139	61.2	1,043	73.5	96	21.7
Maternal and child hygiene	493	26.5	294	20.7	199	45.0
Bed care	219	11.8	106	7.5	113	25.6
Laboratory service	242	13.0	218	15.4	24	5.4
Sanitary inspection	549	29.5	537	37.8	12	2.7
Health education	596	32.0	357	25.2	239	54.1
Immunization	515	27.7	421	29.7	94	21.3
School medical service	540	29.0	487	34.3	53	12.0
Tuberculosis service	306	16.4	209	14.7	97	21.9
Venereal disease service	149	8.0	118	8.3	31	7.0
Dental service	394	21.2	269	19.0	125	28.3
Orthopedic service	149	8.0	89	6.3	60	13.6
Psychiatric service	138	7.4	87	6.1	51	11.5
Eye service	280	15.0	187	13.2	93	21.0
Other services	269	14.5	161	11.3	108	24.4

[1] The total agencies reporting services numbered 1,861, of which 1,419 were official and 442 were nonofficial.

Communicable disease control leads as an official responsibility. This activity, certainly of prime importance, is one of the traditional regulatory measures long since accepted as a public function. Some nonofficial agencies participate in this field, notably nursing organizations that contract with governments to take care of those ill from these diseases. Immunization, that more youthful measure for the control of communicable disease, is carried on to a more nearly equal extent by official and nonofficial agencies.

For measures of sanitation, another traditional public health service, only 38 percent of the official agencies accept responsibility, and less than 3 percent of the nonofficial. Next in order of frequency is school medical service, and here the health and educational authorities participate to about the same degree. Of the voluntary agencies, 12 percent, mostly those concerned with nursing, direct their energies in this channel. Favorite outlets for the energies of voluntary groups are health education and maternal and child hygiene. Laboratory service is not listed with any high degree of frequency by agencies of either type, but it is an official undertaking much more than a nonofficial. It is characteristic of the metropolitan health departments that have set up a program rich in content. Bedside nursing care of the sick is almost exclusively a function of the visiting nurse organizations. The few official departments reporting such service usually give only demonstrations, or render care for particular conditions having some degree of communicability.

From the standpoint of frequency in listing, programs of medical service, such as care of the tuberculous, dentistry, orthopedics, and psychiatry, are more commonly the activities of private agencies than of the tax-supported group covered by this study. Measures for the control of venereal diseases constitute the sole exception to this generalization, but the difference is not great, and neither of the groups shows a particularly creditable performance. Eye and dental services are relatively frequent in programs of both official and nonofficial agencies. Services listed as "other" are, with few exceptions, clinical in character. They pertain to cancer, heart disease, and similar conditions not encompassed by the program of a large number of organizations. Here, too, it may be observed that the development is primarily one by voluntary agencies.

These tabular arrangements of agencies working for the public health can but imperfectly suggest the haphazard way in which much of the effort is applied to the total problem. Cross-currents of purpose do not obviously obstruct each other in statistical delineations. The numerical expression of agencies at work leads one to presuppose accomplishment when actually these agencies may only provide shelter for individuals who do nothing in particular except carry the banner of public health; and the layers upon layers of organization are not made manifest by arraying the various agencies under neat headings. The subject is better adapted to discussion than to statistical analysis. Each jurisdiction has a high degree of individuality, and throughout the country many a variant is played upon the main theme of combating disease and raising the level of health.

The public health problem involves 130 million individuals. It is complex and subtle and always with us; yet the organization to meet it is made up in considerable measure of pasteboard agencies, of rudimentary health departments without positive programs, and of free lance associations. They wage common cause, but often indifferently, or naively, or confusedly, or without regard to the sum total of the effort.

For example, a selected rural county shows a really respectable amount of organization on paper. One of its proud citizens might conceivably boast, "Why, for our 25,000 people we have 30 health departments." They have, and 30 health departments for 25,000 people might well lead the casual observer to assume that no disease has a chance there, that the forces to defy sickness and disability are in the saddle and riding full tilt to the attack.

The true situation, however, is somewhat less gallant. The one sizable town of 6,153 inhabitants has a health department which spent $500 in its health activities for the year covered by the schedule. It is manned by a local physician who devotes a part of his time to the job, his work being listed as control of communicable disease, laboratory service, and sanitary inspection. Just how much in these three services he accomplishes in the time that he can take from his regular practice is a matter for conjecture.

There are 5 village health departments and 24 township health departments in this county. The top expenditure for a single department was $353. Ten reported no expenditures. Communicable disease control and sanitary inspections constituted the bulk of the work. Eleven of these health departments, according to their schedules, are apparently innocent of duties. The personnel for the thirty amounts to 28, including 8 part-time medical men, no nurses, and 20 part-time workers of various other types. Most of the latter would come under the heading of sanitary inspectors with more or less definite jobs in the field of municipal housekeeping.

The Public Health Association and the American Red Cross operate in the county at large, but their combined budgets amount to less than $1,000. The Red Cross also spends around $600 on its work in the county seat. The absence of any sizable nonofficial agencies indicates that the public in general is not aware to any great degree of the health battlefront. The total expenditures reported by the official and nonofficial agencies amount to some $4,030. This sum, even to an innocent bystander in the field of public health, would seem hardly adequate as an annual budget for the public health problems of 25,000 people.

There are many variants up and down the scale from this health set-up. In a county predominantly of urban character, for example, the schedules testify to a more extensive conception of social responsibility for the health of a people. An interesting point in this connection is that the per capita spendable money income does not vary greatly between the two counties; for the urban county it is a little over $500, and for the rural about the same amount under $500. Expenditures for public health in the urban county amount to somewhat over a million dollars for about 365,000 people. These expenditures, when reduced to a per capita base, show a figure of nearly three dollars for the urban as contrasted with an outlay of fifteen cents in the rural county.

The industrial system is a dominant factor in the difference in public health structures between these two counties. The inhabitants of the urban county are gathered into many centers of population, the largest of which is about 115,000. This mass living increases the significance of each individual situation in the total health problem, magnifies the importance of each family that, through circumstances often not of its own making, is forced to live in an unhealthful environment.

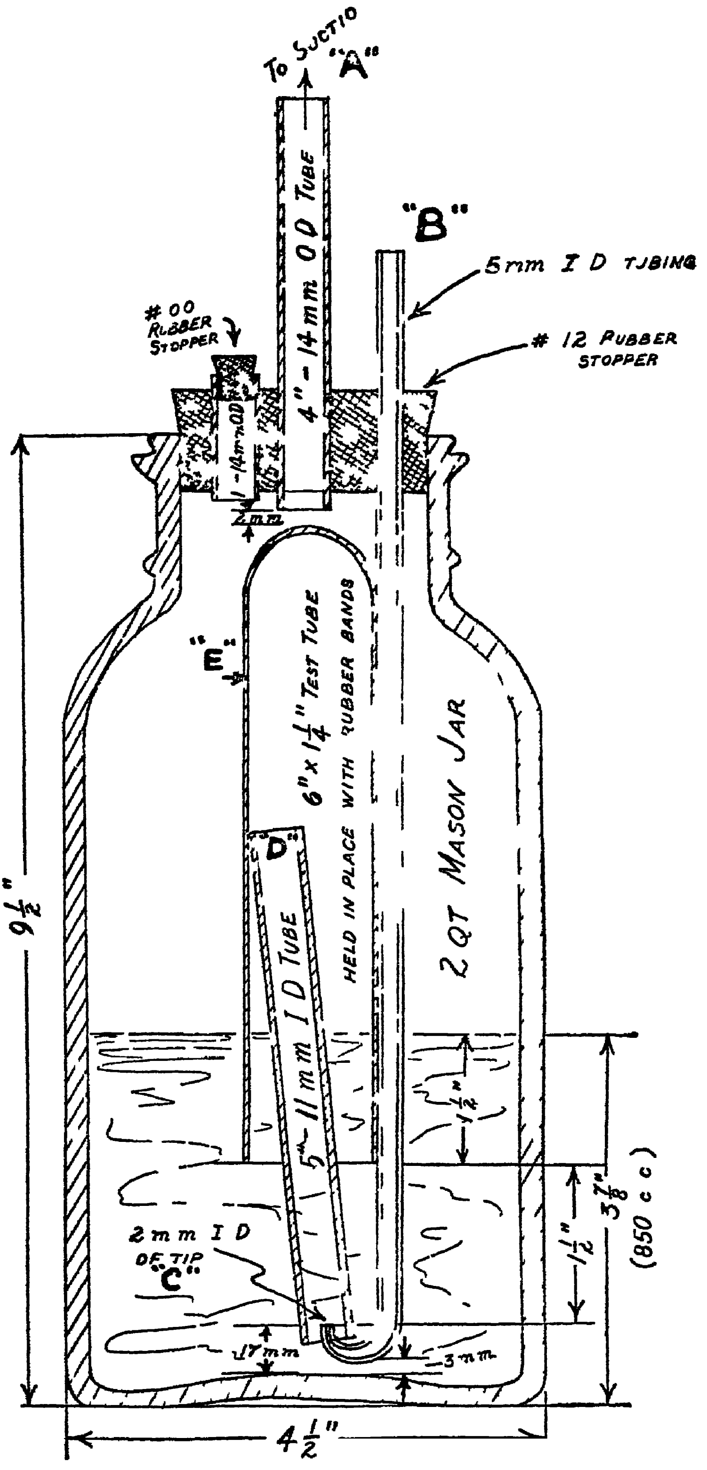
The health departments as a whole throughout this county report programs richer in content than do those of the first county. Among themselves, however, they show considerable variation. One of the smaller departments, with a budget of somewhat over $9,000, reports that communicable disease control and school medical care constitute its program. Another with a budget of about $3,500 reports 15 categories of activity, including psychiatric, orthopedic, and eye services, and efforts toward the control of tuberculosis and venereal disease.

The many centers of population in this county also serve to create a greater number of private agencies contributing to the public health work. The greater and more obvious the problem, the more private citizens will take an interest in it. And, of course, the greater the population, the more persons there are with energies to spare for something other than their personal existence. In the chief city of this county there are 17 such agencies supplementing the work of the health department. They include a nursing association with a budget of over $40,000, a luncheon club with a fund of $113, an order of nuns who give bedside care; in fact, they show a wide range of origins, purposes, and budgets.

The worth of these agencies, as pointed out earlier, is not in question. No one can quarrel with the recognition of a need and the intent to do something about it. Each agency, however, might be highly valuable and competent, and the sum total of effort ill applied to the problem because there existed no integrating factor.

That, specifically, is the criticism of many students of public health. The industrial system may affect the set-up in one place, the scarcity of population may do the same in another, and a high degree of civic consciousness among private citizens may do it in a third. There will naturally be some difference in pattern, but in any pattern there should be a correlation of activity and a unity of understanding and purpose behind the total efforts.

Public health endeavor has somehow escaped the ordering that has been a part of the evolutionary process of most public activities. The purpose of this discussion is not to reason why, not to tell how, but to present a situation. The situation, in brief, is that health is not given its rightful position among other problems of public importance, and its treatment is left largely to whatever chance may develop.



Cross section of model of gas absorption apparatus

A GAS ABSORPTION APPARATUS

By M. Starr Nichols, *Chief Chemist, Wisconsin State Laboratory of Hygiene, Madison, Wisconsin*

Intimate contact of a gas with a liquid is one of the important prerequisites of satisfactory absorption of the gas. In the device illustrated in the accompanying figure, the principle of the air lift pump is applied to gas absorption. The apparatus was originally devised to facilitate absorption of CO_2 from an activated sludge experiment in the treatment of sewage by this process. In this process the ratio of the volume of air to the volume of CO_2 is very great and simple bubbling through weak sodium hydroxide was not satisfactory.

The model illustrated here was designed to absorb SO_2 from the air and was used with success by the Industrial Hygiene Division of the Wisconsin State Board of Health. In this use it is noted that 850 ml of the iodine absorption solution was placed in the 2-quart Mason jar and suction applied to the large central tube which led to the air pump used in collecting dust samples. This air pump was regulated to draw 1 cubic foot per minute through this SO_2 absorption chamber. The application of suction to "A" causes SO_2 bearing air to enter through the 5-mm tube "B" and jet into iodine solution through tip "C." This causes a turbulence in tube "D" with a concomitant rise of a rather intimate mixture of iodine solution and gas in this tube which gushes upward to top of tube "E" to cause further surface exposure and extended contact for absorption. The gas finally emerges from the bottom of tube "E" in large bubbles through the iodine solution. A second bottle in series with the first showed no passage of SO_2 from the single absorption bottle. The apparatus is provided with a third opening through which iodine solution can be admitted.

With this apparatus large volumes of air can be tested in short periods of time, since a flow of air of 1 cubic foot per minute can be washed free of SO_2. For absorption of gases where the pressure is sufficient to cause the flow of air and solution through the apparatus (1 or 2 pounds), it may be operated without the closure at the top. In fact, tube "B" with jet "C," tube "D," and tube "E" to trap the geyser-like flow held in place by a rubber band may be used in an open beaker, cylinder, or large test tube when gas to be absorbed is under pressure.

Acknowledgments.—I wish to thank Dr. Paul Brehm, Dr. H. Ruf, and Mr. Wm. Fluck, of the Industrial Hygiene Division of the Wisconsin State Board of Health, for their assistance in the testing and development of this device.

THE TENTH PAN AMERICAN SANITARY CONFERENCE

Bogotá, Colombia, September 4-18, 1938

According to an announcement by Surgeon General (Retired) Hugh S. Cumming, Director of the Pan American Sanitary Bureau, the Tenth Pan American Sanitary Conference will be held in Bogotá, Colombia, September 4-18, 1938.

Previous conferences have been held in Washington in 1902 and 1905; Mexico City, 1907; San Jose, Costa Rica, 1909-10; Santiago, Chile, 1911; Montevideo, Uruguay, 1920; Habana, Cuba, 1924; Lima, Peru, 1927; and, the latest, in Buenos Aires, Argentina, in November 1934.

It is expected that all of the American Republics will be represented at the Bogotá Conference as was the case in Buenos Aires.

The program of the Conference includes the following subjects:

PROGRAM OF THE CONFERENCE

1. Campaign against venereal diseases: Modern trends and methods and objectives which should be followed. Organization of a Pan American campaign.

2. Human nutrition and alimentation: Report of the Committee on Nutrition designated by the Pan American Sanitary Bureau.

3. Social security in its medical and public health aspects: Reports of the countries in which it has been adopted.

4. Maritime and aerial sanitation from the standpoint of present international treaties.

5. Prenatal and infant hygiene: Progress since the Ninth Pan American Sanitary Conference.

6. Public health: (*a*) Centralization in a trained service; (*b*) composition, selection, promotion (including graded promotions), and guarantees of tenure of the national public health personnel.

7. Rural hygiene: (*a*) Water supply; (*b*) waste and excreta disposal (soil sanitation); (*c*) rural housing.

8. Control and prevention of yellow fever in its new aspects. Results obtained with the new vaccines.

9. Antiplague campaigns, especially in ports.

10. Latest achievements in the study of leprosy and modern organization of the campaign against the disease.

11. Tuberculosis: (*a*) Results of the campaign in each country; (*b*) coordination of work; (*c*) vaccination with BCG.

12. Typhus fever and related diseases in America.

13. Diseases produced by viruses.

14. Regional diseases: (*a*) Malaria—new methods in the antimalaria campaign; (*b*) goiter—prevalence and prevention; (*c*) amebiasis—prevalence; latest methods of diagnosis, prevention, and treatment.

15. Modern ideas and conceptions in the realm of preventive and curative vaccines and sera.

16. The problem of virus and germ carriers in epidemiology: (*a*) Procedure in tracing them; (*b*) prophylaxis and treatment of these carriers.

DEATHS DURING WEEK ENDED MARCH 19, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Mar. 19, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	8,885	9,365
Average for 3 prior years	9,458	----------
Total deaths, first 11 weeks of year	98,427	114,088
Deaths under 1 year of age	544	580
Average for 3 prior years	606	----------
Deaths under 1 year of age, first 11 weeks of year	5,950	6,988
Data from industrial insurance companies:		
Policies in force	69,714,284	69,487,166
Number of death claims	13,368	15,230
Death claims per 1,000 policies in force, annual rate	10.0	11.4
Death claims per 1,000 policies, first 11 weeks of year, annual rate	10.1	11.6

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (......) indicate that cases or deaths may have occurred although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Mar. 26, 1938, and Mar. 27, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Mar. 26, 1938	Week ended Mar. 27, 1937	Week ended Mar. 26, 1938	Week ended Mar. 27, 1937	Week ended Mar. 26, 1938	Week ended Mar. 27, 1937	Week ended Mar. 26, 1938	Week ended Mar. 27, 1937
New England States:								
Maine	2	3	13	13	299	15	0	3
New Hampshire	0	0	1	......	11	47	0	0
Vermont	1	0	......	......	136	......	0	0
Massachusetts	3	3	......	......	287	782	4	4
Rhode Island	0	0	......	......	2	386	1	0
Connecticut	5	8	5	10	34	573	0	1
Middle Atlantic States:								
New York	34	41	[1] 12	[1] 32	2,081	838	8	14
New Jersey	18	13	10	12	1,150	2,183	0	5
Pennsylvania	40	30	......	......	5,691	333	5	6
East North Central States:								
Ohio	22	16	......	62	3,509	238	5	4
Indiana	26	12	18	92	1,322	84	2	4
Illinois	37	33	11	168	6,164	81	1	5
Michigan [2]	12	11	1	6	5,326	92	4	3
Wisconsin	5	6	30	103	5,002	32	0	1
West North Central States:								
Minnesota	3	4	1	3	120	59	0	4
Iowa	2	1	5	2	169	4	0	1
Missouri	21	12	71	192	974	27	2	3
North Dakota	0	0	6	6	60	......	0	0
South Dakota	0	0	......	......	......	2	0	0
Nebraska	1	1	1	......	85	11	1	0
Kansas	3	11	16	11	434	19	0	1
South Atlantic States:								
Delaware	0	0	......	......	24	48	0	1
Maryland [2]	6	5	13	28	90	899	3	5
District of Columbia	6	14	1	1	18	114	1	2
Virginia	11	14	......	......	427	379	3	12
West Virginia	10	5	33	165	695	19	4	7
North Carolina [3]	20	12	5	191	3,115	134	1	5
South Carolina	6	3	314	812	499	32	1	0
Georgia [3]	12	10	......	654	390	......	1	1
Florida [6]	15	5	2	19	726	8	1	5

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Mar. 26, 1938, and Mar. 27, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Mar. 26, 1938	Week ended Mar. 27, 1937	Week ended Mar. 26, 1938	Week ended Mar. 27, 1937	Week ended Mar. 26, 1938	Week ended Mar. 27, 1937	Week ended Mar. 26, 1938	Week ended Mar. 27, 1937
East South Central States:								
Kentucky	17	8	24	79	548	151	1	29
Tennessee [4]	7	13	78	184	553	24	4	7
Alabama [3]	22	12	129	1,330	1,038	8	11	14
Mississippi [2]	6	2					0	0
West South Central States:								
Arkansas	8	5	99	349	340	1	3	3
Louisiana	8	19	20	132	9	7	2	0
Oklahoma [5]	7	3	108	168	86	48	1	2
Texas [3]	47	43	510	1,166	418	518	2	9
Mountain States:								
Montana	1	1		40	73	60	0	0
Idaho	1	0	14	2	1	25	0	0
Wyoming	0	0			33		1	0
Colorado [4]	11	3			578	5	0	0
New Mexico	10	1	1		116	54	0	2
Arizona	2	0	102	64	19	205	0	2
Utah [2]	2	0		1	329	20	0	0
Pacific States:								
Washington	1	1	16	2	9	28	0	4
Oregon	3	0	44	33	50	9	0	3
California	30	20	45	221	541	97	2	4
Total	504	404	1,765	6,359	44,191	8,759	75	176
First 12 weeks of year	7,301 [6]	6,360	33,342	250,891	374,502	70,681	1,084	2,019

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Mar. 26, 1938	Week ended Mar. 27, 1937	Week ended Mar. 26, 1938	Week ended Mar. 27, 1937	Week ended Mar. 26, 1938	Week ended Mar. 27, 1937	Week ended Mar. 26, 1938	Week ended Mar. 27, 1937	Week ended Mar. 26, 1938
New England States:									
Maine	0	0	17	34	0	0	2	2	52
New Hampshire	0	0	12	29	0	0	0	0	4
Vermont	0	0	20	10	0	0	0	0	30
Massachusetts	0	0	439	269	0	0	2	2	128
Rhode Island	0	0	37	60	0	0	1	1	25
Connecticut	0	0	117	107	0	0	1	1	75
Middle Atlantic States:									
New York	2	0	1,028	1,056	0	0	8	14	449
New Jersey	0	1	177	155	0	0	1	1	199
Pennsylvania	0	2	562	623	0	0	8	4	281
East North Central States:									
Ohio	1	4	434	339	18	3	2	2	223
Indiana	1	0	149	268	47	8	0	0	11
Illinois	3	3	592	779	53	63	10	3	114
Michigan [2]	0	0	538	891	12	20	2	2	259
Wisconsin	1	0	159	432	6	1	1	8	126
West North Central States:									
Minnesota	1	0	180	160	16	13	1	1	42
Iowa	2	1	224	327	43	33	2	1	27
Missouri	0	0	211	360	55	68	4	2	41
North Dakota	0	0	22	33	18	15	0	0	9
South Dakota	0	0	13	59	11	0	0	2	31
Nebraska	0	0	41	95	1	14	0	0	9
Kansas	0	0	135	415	22	23	0	1	150
South Atlantic States:									
Delaware	0	0	14	2	0	0	0	0	7
Maryland [3]	0	0	86	35	0	0	0	6	52
District of Columbia	0	0	28	14	0	0	0	0	6
Virginia	0	0	26	30	0	1	5	5	68
West Virginia	0	0	65	40	0	0	1	8	59

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Mar. 26, 1938, and Mar. 27, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fevers		Whooping cough
	Week ended Mar. 26, 1938	Week ended Mar. 27, 1937	Week ended Mar. 26, 1938	Week ended Mar. 27, 1937	Week ended Mar. 26, 1938	Week ended Mar. 27, 1937	Week ended Mar. 26, 1938	Week ended Mar. 27, 1937	Week ended Mar. 26, 1938
South Atlantic States—Con.									
North Carolina [3]	1	0	37	39	2	0	0	2	401
South Carolina	0	1	4	5	0	0	0	2	112
Georgia [3]	1	1	8	21	1	0	3	1	16
Florida	0	0	5	8	0	0	1	2	19
East South Central States:									
Kentucky	1	1	122	36	12	0	2	4	85
Tennessee [4]	0	0	29	25	10	0	6	2	62
Alabama [3]	1	2	11	16	4	0	5	2	40
Mississippi [2]	0	0	7	5	0	0	0	1	0
West South Central States:									
Arkansas	1	0	10	23	11	1	5	0	35
Louisiana	0	0	13	4	0	5	23	5	22
Oklahoma [5]	0	1	24	19	15	0	3	0	40
Texas [3]	1	1	126	83	14	7	15	9	342
Mountain States:									
Montana	0	0	16	36	10	37	0	0	16
Idaho	0	0	15	37	11	1	3	0	27
Wyoming	0	0	20	16	0	2	1	0	6
Colorado [4]	0	0	61	46	13	3	3	0	24
New Mexico	0	0	20	30	0	2	3	0	21
Arizona	0	0	8	18	10	0	7	1	50
Utah [2]	0	0	50	12	2	0	0	0	34
Pacific States:									
Washington	0	1	46	32	34	6	2	0	139
Oregon	0	1	49	31	33	23	0	2	20
California	0	0	202	186	24	8	3	1	485
Total	17	20	6,209	7,410	508	357	136	95	4,473
First 12 weeks of year	255	248	73,014	80,773	6,706	3,654	1,438	1,308	49,468

[1] New York City only.

[2] Period ended earlier than Saturday.

[3] Typhus fever, week ended Mar. 26, 1938, 9 cases as follows: North Carolina, 1; Georgia, 3; Alabama, 3; Texas, 2.

[4] Rocky Mountain spotted fever, week ended Mar. 26, 1938, 2 cases, as follows: Tennessee, 1; Colorado, 1.

[5] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

[6] A corrected report gives the number of diphtheria cases in Florida for the week ended March 19 as 11 instead of 66, as published in the PUBLIC HEALTH REPORTS for April 1, 1938, p. 508.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
December 1937										
Arizona	5	28	432	2	13	2	4	48	4	8
February 1938										
Hawaii Territory	0	17	20	-------	135	-------	2	6	[1] 2	7
Indiana	6	218	83	-------	2,435	-------	-------	780	175	3
Kansas	2	29	44	-------	1,549	2	0	890	100	4
Montana	3	5	126	-------	98	-------	-------	123	61	1
Nevada	1	2	27	-------	20	-------	0	3	0	1
Oklahoma	7	46	991	21	236	16	2	171	86	7
South Dakota	-------	2	20	-------	4	-------	0	95	38	2
Washington	4	11	35	-------	56	-------	2	262	175	2

[1] Off shipping.

Summary of monthly reports from States—Continued

December 1937

	Cases
Arizona:	
Chickenpox	111
Dysentery	81
Encephalitis, epidemic or lethargic	1
Mumps	103
Septic sore throat	9
Typhus fever	8
Whooping cough	66

February 1938

	Cases
Chickenpox:	
Hawaii Territory	78
Indiana	524
Kansas	832
Montana	308
Nevada	22
Oklahoma	137
South Dakota	201
Washington	791
Conjunctivitis:	
Hawaii Territory	1
Oklahoma	1
Washington	2
Dysentery:	
Indiana (amoebic)	1
Kansas (amoebic)	1
Kansas (bacillary)	1
Oklahoma	30
Washington (bacillary)	1
Encephalitis, epidemic or lethargic:	
Washington	4
Foot and mouth disease:	
Kansas	1
German measles:	
Kansas	18
Montana	6
Washington	11
Hookworm disease:	
Hawaii Territory	11
Oklahoma	1
Impetigo contagiosa:	
Hawaii Territory	10
Kansas	2
Montana	30
Washington	2
Leprosy:	
Hawaii Territory	5
Mumps:	
Hawaii Territory	31
Indiana	129
Kansas	1,061
Montana	89
Nevada	72
Oklahoma	12
South Dakota	62
Washington	657
Paratyphoid fever:	
Hawaii Territory	1
Puerperal septicemia:	
Washington	1
Rabies in animals:	
Indiana	50
Washington	23
Scabies:	
Hawaii Territory	1
Montana	3
Washington	1
Septic sore throat:	
Kansas	8
Montana	5
Oklahoma	38
South Dakota	5
Washington	7
Tetanus:	
Hawaii Territory	2
Montana	1
Trachoma:	
Hawaii Territory	1
Kansas	3
Montana	74
Oklahoma	6
Trichinosis:	
Hawaii Territory	2
Tularaemia:	
Indiana	2
Kansas	2
Montana	1
Typhus fever:	
Hawaii Territory	5
Undulant fever:	
Kansas	5
Oklahoma	90
Washington	2
Vincent's infection:	
Kansas	10
Oklahoma	7
Washington	3
Whooping cough:	
Hawaii Territory	220
Indiana	86
Kansas	525
Montana	95
Nevada	21
Oklahoma	169
South Dakota	161
Washington	596

PLAGUE INFECTION IN ADAMS COUNTY, WASH.

Under date of March 24, 1938, Senior Surgeon C. R. Eskey, in charge of plague suppressive measures at San Francisco, Calif., reported that plague infection had been proved in pools of fleas and lice collected from rodents in Adams County, Wash., as follows:

March 7, 1938, in a pool of 181 fleas from 19 *Citellus townsendii* shot 2 miles east of Lind, and in a pool of 103 lice collected from the same group of ground squirrels.

March 9, 1938, in a pool of 179 fleas collected from 27 *Citellus townsendii*, shot 1 mile southeast of Lind.

WEEKLY REPORTS FROM CITIES

City reports for week ended March 19, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	193	505	119	6,745	951	2,643	27	412	20	1,382	--------
Current week	123	122	48	16,878	758	1,866	29	360	37	1,111	--------
Maine:											
Portland	0	1	0	1	3	0	0	2	0	20	27
New Hampshire:											
Concord	0	------	0	1	0	1	0	0	0	0	9
Manchester	0	------	0	0	1	4	0	0	0	0	20
Nashua	0	------	0	0	0	0	0	0	0	0	7
Vermont:											
Barre	0	------	0	26	0	0	0	0	0	2	2
Burlington	0	------	0	2	0	0	0	0	0	2	10
Rutland	0	------	0	0	0	0	0	0	0	0	5
Massachusetts:											
Boston	0	------	0	206	27	88	0	6	0	26	233
Fall River	0	------	1	0	2	1	0	2	0	4	30
Springfield	0	------	0	7	5	1	0	0	0	19	44
Worcester	0	------	0	1	7	33	0	2	0	6	65
Rhode Island:											
Pawtucket	0	------	0	0	1	0	0	0	0	1	17
Providence	0	------	0	3	5	6	0	7	0	13	01
Connecticut:											
Bridgeport	1	------	0	0	6	18	0	1	0	2	38
Hartford	0	------	0	0	3	20	0	0	0	0	35
New Haven	0	1	0	2	4	4	0	1	0	8	47
New York:											
Buffalo	0	------	0	5	14	48	0	7	0	4	136
New York	28	10	3	1,277	173	438	0	68	3	184	1,696
Rochester	0	1	0	8	4	14	0	0	0	4	71
Syracuse	0	------	0	32	3	4	0	0	0	8	48
New Jersey:											
Camden	1	2	2	44	5	7	0	1	0	1	37
Newark	0	1	1	9	14	21	0	3	0	28	114
Trenton	0	------	0	2	5	8	0	0	0	0	41
Pennsylvania:											
Philadelphia	2	4	3	835	36	112	0	16	1	33	500
Pittsburgh	4	------	0	260	25	44	0	5	1	29	149
Reading	1	------	2	18	4	5	0	1	0	9	31
Scranton	0	------	--------	55	-------	13	0	-------	0	4	--------
Ohio:											
Cincinnati	2	4	1	4	7	9	0	10	1	8	123
Cleveland	0	22	1	355	26	76	0	11	0	58	104
Columbus	4	1	1	197	5	7	0	1	0	2	68
Toledo	0	1	1	142	2	9	0	5	0	21	74
Indiana:											
Anderson	0	------	0	59	0	1	0	0	0	1	10
Fort Wayne	0	------	0	109	2	9	0	1	0	1	26
Indianapolis	6	------	0	272	13	34	2	5	0	6	102
South Bend	0	------	0	12	4	4	0	0	0	2	21
Terre Haute	0	------	0	29	0	2	0	0	0	0	17
Illinois:											
Alton	0	------	0	0	2	6	0	0	0	0	5
Chicago	7	3	0	3,275	48	237	0	28	1	41	697
Elgin	0	------	0	5	0	5	0	0	0	2	12
Moline	0	------	0	49	1	8	0	0	0	0	9
Springfield	0	------	0	222	4	2	0	1	0	4	28
Michigan:											
Detroit	3	1	0	3,195	20	138	0	19	1	68	294
Flint	0	------	0	4	3	59	0	1	0	13	19
Grand Rapids	0	------	0	48	1	15	0	0	0	2	30
Wisconsin:											
Kenosha	0	------	0	60	0	1	0	0	0	2	7
Milwaukee	2	------	0	3,471	7	12	0	4	0	36	97
Racine	0	------	0	50	0	9	0	0	0	10	16
Superior	0	------	0	5	1	4	1	0	0	4	9
Minnesota:											
Duluth	0	------	0	1	2	1	0	3	1	5	27
Minneapolis	0	------	0	34	1	27	2	2	0	4	91
St. Paul	0	------	1	1	7	8	0	3	0	3	75

City reports for week ended March 19, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Iowa:											
Cedar Rapids	0	------	------	1	------	3	0	------	0	2	------
Davenport	0	------	------	14	------	0	0	------	0	0	------
Des Moines	0	------	------	13	------	31	0	------	0	2	35
Sioux City	0	------	------	0	------	3	0	------	0	2	------
Waterloo	0	------	------	80	------	3	0	------	0	0	------
Missouri:											
Kansas City	0	2	1	232	12	8	0	4	0	2	109
St. Joseph	0	------	1	65	3	0	0	0	0	0	27
St. Louis	5	------	0	16	7	103	6	12	0	0	184
North Dakota:											
Fargo	0	------	0	0	2	1	0	0	0	3	12
Grand Forks	0	------	------	13	------	0	0	------	0	0	------
Minot	0	------	0	0	0	1	3	0	0	0	6
South Dakota:											
Aberdeen	0	------	------	0	------	1	0	------	0	1	------
Nebraska:											
Omaha	0	------	0	11	10	2	1	6	0	0	70
Kansas:											
Lawrence	0	------	0	0	0	0	0	0	0	0	8
Topeka	0	------	0	74	0	1	0	0	0	26	13
Wichita	0	------	0	1	5	8	0	1	0	2	22
Delaware:											
Wilmington	3	------	0	20	5	3	0	2	0	3	33
Maryland:											
Baltimore	2	4	0	5	24	45	0	10	0	32	217
Cumberland	0	1	0	6	3	2	0	0	0	0	12
Frederick	0	------	0	0	0	0	0	0	0	0	6
Dist. of Col.:											
Washington	7	5	1	11	8	18	0	7	0	11	174
Virginia:											
Lynchburg	1	------	0	0	0	0	0	0	0	3	9
Norfolk	0	------	0	287	1	11	0	2	0	10	20
Richmond	0	------	2	45	3	4	0	1	0	0	41
Roanoke	1	------	0	0	1	2	0	2	0	3	19
West Virginia:											
Charleston	0	------	0	25	2	1	0	1	1	4	25
Huntington	1	------	------	6	------	2	0	------	0	0	------
Wheeling	0	1	0	276	3	2	0	0	0	11	24
North Carolina:											
Gastonia	0	------	------	22	------	0	0	------	0	3	------
Raleigh	0	------	0	87	3	0	0	0	0	23	15
Wilmington	0	------	0	254	2	0	0	0	0	13	18
Winston-Salem	0	------	0	13	1	0	0	1	0	62	12
South Carolina:											
Charleston	0	9	2	24	4	0	0	2	0	0	27
Florence	0	------	0	8	2	0	0	0	0	0	7
Greenville	0	------	0	4	0	1	0	0	0	14	8
Georgia:											
Atlanta	1	10	1	135	11	5	1	11	1	6	102
Brunswick	0	------	0	0	0	0	0	0	0	0	3
Savannah	0	9	1	104	1	0	0	0	0	4	26
Florida:											
Miami	0	1	1	108	5	0	0	1	0	6	44
Tampa	3	------	0	2	0	1	0	2	0	0	21
Kentucky:											
Ashland	0	------	0	4	5	0	0	2	0	3	21
Covington	0	------	0	2	0	0	0	0	0	1	14
Lexington	0	------	0	0	2	0	0	2	0	1	21
Louisville	0	2	0	208	7	88	0	3	0	6	69
Tennessee:											
Knoxville	0	1	1	46	7	3	0	1	0	2	33
Memphis	1	------	3	186	7	3	0	3	0	6	78
Nashville	1	------	1	122	4	5	0	3	0	11	56
Alabama:											
Birmingham	1	10	3	159	6	5	0	7	0	0	88
Mobile	0	------	1	35	2	0	0	1	0	0	24
Montgomery	0	1	------	116	------	1	0	------	0	4	------
Arkansas:											
Fort Smith	0	------	------	6	------	0	0	------	0	1	------
Little Rock	0	------	0	50	8	2	0	1	1	0	10
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	0	5
New Orleans	4	1	6	2	21	4	0	8	17	16	164
Shreveport	0	------	0	3	11	3	0	3	2	0	51

City reports for week ended March 19, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Oklahoma:											
Oklahoma City	1	------	1	0	2	5	1	0	0	0	45
Tulsa	1	------	--------	41	-------	3	1	-------	0	2	--------
Texas:											
Dallas	2	2	1	4	7	14	0	2	1	2	77
Fort Worth	0	------	0	0	0	2	1	3	0	3	33
Galveston	0	------	0	0	4	0	0	1	0	0	17
Houston	1	2	0	0	8	3	0	4	1	0	81
San Antonio	0	------	3	1	8	0	0	9	1	0	68
Montana:											
Billings	0	------	0	0	0	0	0	0	0	0	8
Great Falls	0	------	0	0	5	0	0	0	0	8	11
Helena	0	------	0	0	0	2	0	0	0	2	3
Missoula	0	------	0	1	1	0	0	0	0	0	4
Idaho:											
Boise	0	------	0	0	0	0	4	0	0	0	9
Colorado											
Colorado Springs	0	------	0	1	3	3	0	2	0	0	10
Denver	4	------	0	490	16	9	0	2	1	0	96
Pueblo	0	------	1	3	4	3	0	0	0	4	11
New Mexico:											
Albuquerque	0	------	0	3	2	5	0	0	0	0	4
Utah:											
Salt Lake City	0	------	0	308	2	5	0	3	0	4	40
Washington:											
Seattle	0	------	3	2	12	6	1	4	1	40	110
Spokane	0	1	1	1	4	1	1	1	0	8	37
Tacoma	0	------	0	0	1	8	2	0	0	6	25
Oregon:											
Portland	1	10	1	7	7	23	2	3	0	3	97
Salem	0	1	--------	2	-------	0	0	-------	0	0	--------
California:											
Los Angeles	16	13	0	22	17	42	8	22	0	36	326
Sacramento	4	------	0	3	2	2	0	4	0	71	29
San Francisco	0	1	0	2	7	16	0	9	1	0	169

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
New York:			
Buffalo	2	0	0
New York	0	1	2
Pennsylvania:			
Philadelphia	2	0	0
Pittsburgh	1	0	0
Ohio:			
Cincinnati	1	0	0
Cleveland	2	0	0
Illinois:			
Chicago	2	0	0
Michigan:			
Detroit	1	0	0
Missouri:			
Kansas City	1	1	0
North Dakota:			
Grand Forks	1	1	0
Virginia:			
Richmond	0	1	0
Florida:			
Miami	1	1	0
Tennessee:			
Nashville	1	0	0
Alabama:			
Birmingham	5	2	0
Montgomery	0	0	1
Texas:			
Houston	0	0	1
Colorado:			
Denver	0	0	1
Washington:			
Seattle	0	1	0
Tacoma	0	0	1
California:			
Los Angeles	0	0	1
Sacramento	0	1	0
San Francisco	1	0	0

Encephalitis, epidemic or lethargic.—Cases: New York, 3; Pittsburgh, 1; Kansas City, 2; St. Louis, 2.

Pellagra.—Cases: Philadelphia, 1; Charleston, S. C., 1; Atlanta, 3; Savannah, 1; Birmingham, 1; San Antonio, 1; San Francisco, 1.

Typhus fever.—Cases: New Orleans, 1; Houston, 1.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—2 weeks ended February 26, 1938.—During the 2 weeks ended February 26, 1938, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia [1]	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis				3	4			1		8
Chickenpox		15	11	374	577	101	34	18	282	1,415
Diphtheria		3	8	88	14	3	1	2	1	120
Dysentery					3					3
Erysipelas				22	1	3		3	4	33
Influenza		35			39	1			31	106
Lethargic encephalitis					2					2
Measles		119	5	268	517	32	40	100	120	1,201
Mumps		53			330	206	5	14	49	657
Paratyphoid fever					1					1
Pneumonia	4	24			56		3		23	110
Poliomyelitis				2	1			1		4
Scarlet fever		25	5	306	292	58	92	136	115	1,029
Smallpox							7	3		10
Trachoma									1	1
Tuberculosis	3	12	5	99	106	30		3	30	288
Typhoid fever		1	1	30	4	1			4	41
Undulant fever				1	3					4
Whooping cough		10		216	180	33	3	11	68	521

[1] Week ended Mar. 2, 1938.

Vital statistics—Third quarter 1937.—The Bureau of Statistics of the Dominion of Canada has published the following preliminary statistics for the third quarter of 1937. The rates are computed on an annual basis. There were 19.8 live births per 1,000 population during the third quarter of 1937 and 20.3 per 1,000 population during the third quarter of 1936. The death rate was 9.3 per 1,000 population for the third quarter of 1937 and 8.9 per 1,000 population for the third quarter of 1936. The infant mortality rate for the third quarter of 1937 was 80 per 1,000 live births and 56 per 1,000 live births for the third quarter of 1936. The maternal death rate was 4.0 per 1,000 live births for the third quarter of 1937 and 5.0 per 1,000 live births for the same quarter of 1936.

The accompanying tables give the numbers of births, deaths, and marriages by Provinces for the third quarter of 1937, and deaths from certain causes in Canada for the third quarter of 1937 and the corresponding quarter of 1936.

Number of births, deaths, and marriages, third quarter 1937

Province	Live births	Deaths (exclusive of still-births)	Deaths under 1 year of age	Maternal deaths	Marriages
Canada [1]	55, 373	25, 924	4, 434	222	27, 179
Prince Edward Island	547	223	29	4	174
Nova Scotia	2, 316	1, 233	175	4	1, 319
New Brunswick	2, 621	1, 406	383	9	1, 235
Quebec	19, 024	8, 909	2, 318	95	8, 894
Ontario	15, 868	8, 588	822	71	9, 066
Manitoba	3, 492	1, 353	183	10	1, 627
Saskatchewan	4, 830	1, 383	230	10	1, 476
Alberta	3, 842	1, 186	161	11	1, 557
British Columbia	2, 833	1, 643	133	8	1, 831

Cause of death	Canada [1] (third quarter)		Province, third quarter 1937								
	1936	1937	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
Automobile accidents	494	579	3	25	32	151	200	28	16	24	40
Cancer	2, 897	2, 945	31	154	117	791	1, 130	176	158	139	249
Diarrhea and enteritis	807	2, 425	14	91	319	1, 506	278	66	98	29	24
Diphtheria	49	86		1	4	67	6	2	3	3	
Diseases of the arteries	2, 028	2, 039	16	126	65	387	1, 005	128	96	86	130
Diseases of the heart	3, 608	3, 541	25	157	154	846	1, 508	201	180	165	305
Homicides	25	26				3	14	1	2	2	4
Influenza	227	243	3	11	8	79	79	12	23	15	13
Measles	53	106			1	41	6	1	17	22	18
Nephritis	1, 404	1, 387	25	50	43	657	396	56	58	34	68
Pneumonia	907	879	10	33	38	272	317	55	44	51	59
Poliomyelitis	36	135		2	4	9	100	7	11	2	
Puerperal causes	280	222	4	4	9	95	71	10	10	11	8
Scarlet fever	41	38		1	1	19	9	1	4	3	
Suicides	217	263		7	9	46	87	28	26	27	33
Tuberculosis	1, 624	1, 552	20	113	88	670	317	95	54	82	113
Typhoid fever and paratyphoid fever	79	97		4	11	47	15	3	12	2	3
Whooping cough	139	192	1	8		116	26	14	8	13	6
Violent deaths	2, 087	1, 420	8	58	44	413	518	89	75	89	135

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[1] Exclusive of Yukon and the Northwest Territories.

CUBA

Habana—Communicable diseases—4 weeks ended March 12, 1938.—During the 4 weeks ended March 12, 1938, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	17	1	Tuberculosis	9	2
Malaria	[1] 7		Typhoid fever	[1] 99	12
Scarlet fever	2				

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[1] Includes imported cases.

JAMAICA

Communicable diseases—4 weeks ended March 19, 1938.—During the 4 weeks ended March 19, 1938, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis		2	Leprosy		4
Chickenpox	60	57	Poliomyelitis		1
Diphtheria	9	6	Puerperal sepsis		5
Dysentery (amoebic)	7	3	Tuberculosis	36	81
Erysipelas		1	Typhoid fever	2	40

YUGOSLAVIA

Communicable diseases—4 weeks ended February 27, 1938.—During the 4 weeks ended February 27, 1938, certain communicable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	17		Paratyphoid fever	20	
Cerebrospinal meningitis	92	22	Poliomyelitis	2	
Diphtheria and croup	817	67	Scarlet fever	201	3
Dysentery	12	2	Sepsis	13	4
Erysipelas	181	8	Tetanus	15	6
Favus	11		Typhoid fever	379	50
Lethargic encephalitis	1	1	Typhus fever	118	10

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for March 25, 1938, pages 470–483. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

Indochina (French).—During the week ended March 19, 1938, cholera was reported in French Indochina, as follows: Annam Province, 4 cases; Tonkin Province, 29 cases; Hanoi, 10 cases.

Plague

United States—Washington.—A report of plague-infected fleas and lice in Adams County, Wash., appears on page 544 of this issue of PUBLIC HEALTH REPORTS.

Yellow Fever

Ivory Coast—Grand Bassam.—During the week ended March 12, 1938, 2 fatal cases of yellow fever were reported in Grand Bassam, Ivory Coast.

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Sickness and Disability Among Railroad Employees, 1930–34
The Occurrence of Tularaemia in the Rabbit Tick in Alaska

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UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg. Gen. ROBERT OLESEN, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PUBLIC HEALTH REPORTS

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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

February 27–March 26, 1938

The accompanying table summarizes the prevalence of eight important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the Public Health Reports under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ending March 26, the number reported for the corresponding period in 1937, and the median number for the years 1933–37.

DISEASES ABOVE MEDIAN PREVALENCE

Measles.—The current epidemic of measles has continued to increase in severity. The number of reported cases for the current 4-week

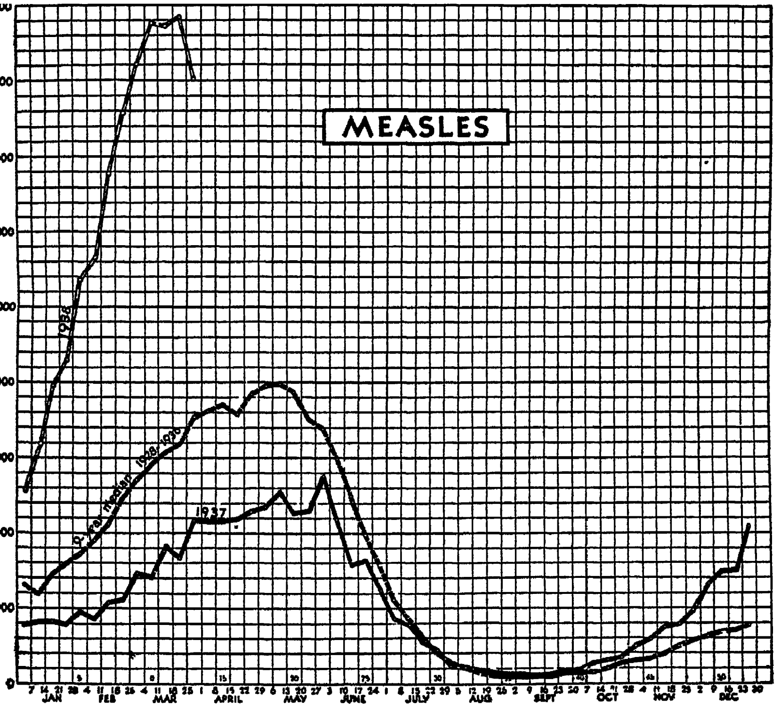

FIGURE 1.—Numbers of cases of measles reported by weeks for 1937 and 1938 and the median number of cases for the years 1928–36.

period was 172,626, as compared with 71,296 and 134,607 cases reported for the first and second 4-week periods of this year. The number of cases is more than five times that reported for the corresponding period last year and nearly three times the median number reported for 1933–37.

The New England, West North Central, and Pacific States continue to be relatively free from measles as compared with the remainder of the country. The largest number of cases relative to the seasonal expectancy is reported from the East North Central region—Ohio, Indiana, Illinois, Michigan, and Wisconsin—where the reported number of cases is nearly 8 times the seasonal expectancy, and in the East South Central region—Kentucky, Tennessee, Alabama, and Mississippi—where the current incidence is more than 10 times the seasonal expectancy based on the 5 years 1933–37.

According to past experience, the real decline in the number of reported cases usually occurs in the latter part of April; however, it may be that the peak will be reached earlier this year, as the present curve of high prevalence (fig. 1) began earlier than in prior years. The numbers of cases reported recently by weeks are as follows: Week ended March 19—43,622 cases; March 26—44,191; April 2—40,085; and week ended April 9—37,319. The number of cases reported for the first 12 weeks of the year is larger than the number reported for the entire year for both 1936 and 1937; and unless the current epidemic abates more quickly than past experience indicates, 1938 will be a year of unusual prevalence of measles.

Smallpox.—The smallpox incidence remains relatively high. The number of reported cases (2,056) for the 4 weeks ending March 26 was more than one and one-half times the number reported for the corresponding period in 1937 and two and one-half times the average incidence for the years 1933–37. The North Atlantic region remains free from the disease and the South Atlantic region reports only a slight increase over the normal seasonal incidence, but in other regions the increases range from nearly twice the 1933–37 average in the Mountain region to 14 times the corresponding average in the East South Central region. States reporting a relatively high incidence are Washington, 222 cases; Missouri, 205; Indiana, 173; Illinois, 164; Iowa, 145; and Oregon, 124—more than one-half of the total number of cases occurred in those six States.

Typhoid fever.—For the current period there were 452 cases of typhoid fever reported, as compared with 423, 362, and 385 for the corresponding period in 1937, 1936, and 1935. Due largely to a relatively large number of cases in Louisiana (98 for the current period as against 28 for the same period in 1937), the current incidence is slightly above that for last year and also above the 1933–37 median, which is represented by last year's figure of 423 cases. Prevalence of the disease is about normal in all sections of the country except the West South Central, which includes Louisiana.

Poliomyelitis.—The number of reported cases (81) of poliomyelitis was about normal for the season. Only the South Atlantic and South Central regions reported any definite increase over the seasonal expectancy. The 15 cases reported from the South Atlantic regions was the highest number reported from that area in recent years, and the cases in the South Central areas approximated those of 1937, when the disease was quite prevalent at this time in those regions. Other geographic regions reported about the usual seasonal incidence.

Number of reported cases of 8 communicable diseases in the United States during the 4-week period Feb. 27–Mar. 26, the number for the corresponding period in 1937, and the median number of cases reported for the corresponding period 1933–37 [1]

Division	Current period	1937	5-year median	Current period	1937	5-year median	Current period	1937	5-year median	Current period	1937	5-year median
	Diphtheria			Influenza [2]			Measles [3]			Meningococcus meningitis		
United States [1]	2,159	1,776	2,533	8,724	41,476	19,456	172,626	32,967	62,153	329	772	646
New England	69	37	64	53	450	155	2,787	7,454	7,453	12	35	18
Middle Atlantic	375	374	431	148	319	280	41,168	13,320	20,187	57	105	93
East North Central	443	354	398	334	1,506	1,320	78,386	1,453	10,197	40	92	137
West North Central	149	169	302	645	1,301	1,219	6,924	301	7,870	43	31	63
South Atlantic	441	291	349	1,691	12,148	5,643	23,754	5,469	5,539	58	166	121
East South Central	157	147	163	1,037	10,134	3,491	9,864	618	967	73	180	59
West South Central	286	265	388	3,877	12,140	6,765	3,257	2,114	2,342	27	110	55
Mountain	98	50	76	473	709	709	4,426	1,590	1,599	3	42	27
Pacific	141	89	157	466	2,769	1,310	2,060	639	4,956	16	11	17
	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
United States [1]	81	78	78	25,538	30,157	30,157	2,056	1,290	810	452	423	423
New England	2	1	2	2,224	2,045	1,891	0	0	0	10	18	17
Middle Atlantic	10	7	7	6,947	7,900	7,900	0	5	0	48	47	66
East North Central	13	19	11	8,020	10,491	10,718	471	199	146	67	70	61
West North Central	4	6	8	3,711	5,961	2,425	620	685	282	21	27	27
South Atlantic	15	10	9	1,175	782	1,195	22	5	12	51	80	80
East South Central	11	13	4	648	362	474	115	0	8	31	45	45
West South Central	11	12	8	693	617	562	205	59	81	171	93	79
Mountain	4	3	3	826	837	837	164	126	91	27	14	19
Pacific	11	7	16	1,294	1,102	1,325	450	211	107	26	29	29

[1] 48 States. Nevada is excluded and the District of Columbia is counted as a State in these reports.
[2] 44 States and New York City.
[3] 46 States. Mississippi and Georgia are not included.

DISEASES BELOW MEDIAN PREVALENCE

Meningococcus meningitis.—Fewer cases of meningococcus meningitis were reported for the 4 weeks ending March 26 than have been reported for the corresponding period in 6 years. The number of cases (329) was only about 43 percent of the number reported for the same period in 1937 and about 50 percent of the 1933–37 average incidence. The low incidence was quite general. Each region, except the East South Central and Pacific regions, reported a definite decrease from the normal seasonal expectancy. In the East South Central area the incidence was about 20 percent above the 1933–37 median, while in the Pacific area it stood at about the median level.

Diphtheria.—The total number of cases (2,159) of diphtheria reported for the current period is about 22 percent in excess of the figure for this period in 1937 but about the same as that for the corresponding period in 1936. Four geographic regions, the East North Central, South Atlantic, Mountain, and Pacific regions, showed rather definite increases over the expected seasonal incidence. Other regions either closely approximated the 1933–37 median or fell considerably below. For the country as a whole, the current incidence is about 15 percent below the average seasonal incidence.

Influenza.—The influenza incidence (8,724 cases) is unusually low. In 1937, 1936, and 1935 the numbers of cases for this period totaled approximately 41,000, 43,000, and 19,000, respectively. In 1934, a year in which the influenza incidence was also unusually low, 11,259 cases were reported for this period. All sections of the country show a relatively low incidence.

Scarlet fever.—For the country as a whole the scarlet fever incidence is the lowest reported for this period in 6 years. The number of cases (25,538) is about 85 percent of the number for the corresponding period in 1937, which figure also represents the median incidence for the years 1933–37. In the New England, West North Central, and South Central regions the incidence is somewhat above the normal seasonal level, while the Middle Atlantic and East North Central regions report a relatively low incidence; in the South Atlantic, Mountain, and Pacific regions the incidence is about normal for this season of the year.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ending March 26, based on data received from the Bureau of the Census, is 12.2 per 1,000 estimated population (annual basis). For the corresponding period in the years 1937, 1936, and 1935 the rates were 13.1, 14.2, and 12.7, respectively. The current rate is no doubt due largely to a low incidence of influenza. In 1934, a year also unusually free from influenza, the rate for this period was 12.8.

FREQUENCY OF SICKNESS AND NONINDUSTRIAL ACCIDENTS CAUSING DISABILITY LASTING 8 CALENDAR DAYS OR LONGER AMONG 60,000 WHITE MALE RAILROAD EMPLOYEES, 1930–34, INCLUSIVE [1]

By WILLIAM M. GAFAFER, *Senior Statistician, United States Public Health Service*

Introduction.—The question of the frequency of occurrence of disabilities among the workers of a specific industry has been periodically raised, and an opportunity to consider the question in the instance of railroad workers presented itself when the requisite data were made available by the Occupational Morbidity and Mortality Study. The disability data of this study, representing about 60 industries, were transcribed from the medical records of the sick benefit organizations connected with the industries and, generally, cover the period 1930 to 1934, inclusive. Because of the existence, however, of certain sick benefit organization regulations, disabilities lasting less than a certain specified period of time were not recorded by the organizations. The present inquiry is based on certain selected data from six railroads. About 60,000 white male employees are represented, and during 1930–34 these averaged about 50 months of membership in their respective sick benefit organizations. Over 3 million days of disability were recorded, and these were yielded by nearly one-quarter million person-years of membership; the average daily percentage of employees disabled was 3.7.

In certain of the text tables it will be observed that the durations of disabilities, particularly the longer ones, are broadly classified. It was believed that durations in greater detail should be made generally available, and this information is presented in the appendix table.

The present report, in brief, makes inquiry into the frequency of recorded disabling sickness and disability from nonindustrial accidents lasting 8 calendar days or longer among approximately 60,000 white male railroad employees, the disabilities being specific for age group and duration, and the period of time during which the disabilities occurred extending from 1930 through 1934. It is planned to present in a later report an analysis of recorded disabling sickness among railroad workers dealing primarily with rates of disability and severity.

Inherent limitations of the data.—The sickness data, transcribed from the medical records of the sick benefit organizations, are by no means complete because of certain regulations governing the organizations. Only those disabilities were included for which sick benefits had been paid, and these disabilities had to be longer than the so-called *waiting period.*[2] Thus in four of the sick benefit organizations the length of the waiting period was 6 days, while in the other two the corresponding figure was 7 days. In this report the 7-day disabilities occurring among the employees of the railroads with organizations subscribing to a 6-day waiting period have been omitted. Furthermore, accidents of industrial origin are not included, and generally the records are not inclusive of all disabling illnesses and nonindustrial accidents of the duration specified above since most of the organizations refuse sick benefits for disability resulting from the "improper use of stimulants or narcotics," "immoral practices," venereal disease, voluntary self-injury, the violation of any civil law, and fighting. One organization debarred from membership those applicants with chronic ailments. Moreover, four of the organizations specified an age limit of 45 years for employees desiring membership, resulting probably in relatively fewer employees at the older ages in these organizations than are found among the general railroad population. Thus for all of these reasons it follows that the sickness frequencies presented in this report are probably lower than those that actually existed. Because of the importance of the organization regulations in their relation to recorded sickness, they are presented more completely and in more detail in the following section and in the table accompanying it.

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[1] From the Division of Industrial Hygiene of the National Institute of Health, U. S. Public Health Service. The supporting data of this report are drawn from material collected by the Occupational Morbidity and Mortality Study of the National Health Survey. The study was made possible by a grant from the Works Progress Administration in 1935. It is planned to issue a separate report on occupational morbidity and mortality among railroad employees.

The sick benefit organizations.[3]—Railroads A, B, D, and E had company-managed relief associations, railroad F had a relief association jointly managed by the company and the employees, and railroad C had group insurance.[4] All sick benefit organizations required that the applicant for membership be an employee of the railroad company with which the particular organization was connected. Furthermore, all organizations required the passing of a physical examination by the employee desirous of becoming a member. Organizations A, B, E, and F stipulated that the applicant be less than 45 years of age, while C and D specified no age limit. Membership was voluntary in all organizations. With the exception of organization B, none barred applicants from membership because of chronic ailments. The pertinent information concerning the organizations is summarized in table 1.

Medical provisions.—Railroad A provided medical examiners, clinic treatments, and consultant and first-aid work by nurses and first-aid men. Provisions were made for the medical examination of trainmen and track workers every 2 years to age 40, and every year thereafter.

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[2] The length of time required to elapse after onset of disability before benefit payments begin.

[3] In this connection compare a report (*1*) based on all of the sick benefit organizations which supplied data to the Occupational Morbidity and Mortality Study.

[4] The letters A, B, C, D, E, and F refer to the railroads, respectively, whose combined data form the material upon which this report is based. The same letters are carried by the respective sick benefit organizations of the railroads. Thus railroad A's organization is organization A.

TABLE 1.—*Descriptive data concerning sick benefit organizations connected with 6 railroads*

Item	Sick benefit organization A	Sick benefit organization B	Sick benefit organization C	Sick benefit organization D	Sick benefit organization E	Sick benefit organization F
Age limit of applicant	45 years	45 years	None	None	45 years	45 years.
Physical examination required of applicant.	Yes	Yes	No	Yes	Yes	Yes.
Occupations excluding from membership.	None	None	None	None	None	None.
Chronic ailments debarring from membership.	do	All	do	do	do	Do.
Length of service before eligible for membership.	do	None	6 months	1 day	do	Do.
Retention of membership for sick benefits:						
(1) During lay-offs.	For 270 days	For 270 days	For 90 days	Prior to July 1, 1933, 60 days. After July 1, 1933, 90 days.	"Remaining portion of the month's absence plus 60 days."	2 years.
(2) After separation.	Membership terminates	Membership terminates	Membership terminates.	Membership terminates	Membership terminates	Memberhip terminates.
Provisions for reinstatement.	None	If reinstated within 9 months of discharge, member will be considered as only suspended; after 9 months, he assumes applicant's status.	Reemployment means reinstatement.	Reemployment means reinstatement.	If reinstated within 12 months, employee becomes full member without medical examination; otherwise he assumes applicant's status.	Upon return to duty within 24 months, employee becomes full member; otherwise he assumes applicant's status.
Initial waiting period [1]	None	None	None	None	None	None.
Waiting period [2]	6 days	6 days	7 days	6 days, but no waiting period for nonindustrial accidents.	7 days	6 days.
Classes of membership	5 classes depending on wages received.	5 classes depending on wages received.	1 class	5 classes depending on wages received.	5 classes	6 classes based on salary.

[1] The length of time required to elapse before a member becomes eligible for sick benefits after joining the sick benefit organization.

[2] Length of time required to elapse after onset of disability before benefit payments begin.

TABLE 1.—*Descriptive data concerning sick benefit organizations connected with 6 railroads*—Continued

Item	Sick benefit organization A	Sick benefit organization B	Sick benefit organization C	Sick benefit organization D	Sick benefit organization E	Sick benefit organization F
Monthly dues paid by members.	$1 to $5, determined by membership class.	$0.75 to $3.75 determined by membership class.	Unknown	$0.75 to $3.75, Jan. 1, 1930 to June 30, 1934; $0.85 to $4.25, July 1, 1934 on.	$0.75 to $5.50, determined by membership class.	$0.55 to $4.50, determined by membership class.
Benefit period	52 weeks per case, half benefits continuous thereafter. 52 weeks maximum per year, half benefits continuous thereafter.	52 weeks per case, half benefits continuous thereafter. 52 weeks maximum per year, half benefits continuous thereafter.	13 weeks per case, 52 weeks maximum per year. No reduction in benefits.	104 weeks per case, 52 weeks full benefits and 52 weeks with 50 percent reduction in benefits.	For duration of illness, if member has been employed over 1 year. 52 weeks full benefits, 50 percent reduction continuous to end of illness.	For members joining prior to April 15, 1928: 52 weeks full benefits, half benefits indefinitely. For those joining after April 15, 1928: 52 weeks full benefits, and 52 weeks half benefits.
Resumption of payment of sick benefits for new cases of illness and chronic cases.	Successive periods of disability from the same cause are summed in computing the 52 weeks of full-rate benefits; if at work for 13 full weeks, the case is considered a new case, and the member is eligible for 52 full weeks again; otherwise, the member receives half benefits.	Successive periods of disability from the same cause are summed in computing the 52 weeks of full-rate benefits; if at work for 13 full weeks, the case is considered a new case, and the member is eligible for 52 full weeks again; otherwise, the member receives half benefits.	No provisions	All chronic diseases not specifically waived are paid for.	If a member returns to duty after receiving sick benefits for less than 12 weeks and is disabled by recurrence of the same cause within 2 weeks thereafter; or if a member returns to duty after receiving sick benefits for 12 weeks or longer, and is disabled by recurrence of the same cause within 26 weeks thereafter, the disablements, in either case, will be treated as one in computing the period for which full benefits may be paid, and if so treated the deduction of 7 days will be made only from the first disablement.	If a member has recovered from 1 disability and shall continue disabled from another disability, the time for which benefits are payable shall not be affected by the preceding disability. Chronic diseases when contracted in service are treated as ordinary cases. Relapse from same illness requires no waiting period.
Amount of sick benefits per week.	$3.50 to $17.50, depending on membership class.	$3.50 to $17.50, depending on membership class.	$15	$3.50 to $17.50, depending on membership class.	$3.50 to $17.50, depending on membership class.	$2.40 to $16.80.

Are sick benefits paid for a fraction of a week?	Yes	Yes	Yes	Yes	Paid by day, 7-day week.	Yes.
Payment of wages during disability.	Monthly-rate employees (office and executive) are paid a fluctuating percentage of wages during which time no benefits are received from the sick benefit organization.	No wages paid during disability	No wages paid except in exceptional cases.	No wages paid during disability.	In some instances wages continue for 12 days.	In some instances wages are received but no sick benefits are paid.
Notification, certification, and verification of disability.	Case must be reported immediately. Physician's certificate of illness required, and nature of illness reported by him. Company physician responsible for detecting malingering.	Proof must be submitted within 1 year. Physician's certificate of illness not required if passed by medical examiner. The latter reports nature of illness and is responsible for detecting malingering.	Proof must be submitted within 30 days. Physician's certificate of illness required and nature of illness is reported by him. No method is used to detect malingering.	Case must be reported within "reasonable time." Physician's certificate of illness required and nature of illness is reported by him. The organization physician and nurse are responsible for detecting malingering.	Disability benefits begin with date of notification. Physician's certificate of illness required and nature of illness is reported by him. The organization physician is responsible for detecting malingering.	Case must be reported immediately. Physician's certificate of illness is required and nature of illness is reported by him. Medical examiner is responsible for detecting malingering.
Refusal of sick benefits because of.	Improper use of stimulants or narcotics, immoral practices, voluntary self-injury, unlawful acts, and fighting.	Improper use of stimulants or narcotics, immoral practices, venereal diseases, voluntary self-injury, unlawful acts, and fighting.	Fighting, if aggressor	Improper use of stimulants or narcotics, immoral practices, venereal diseases, voluntary self-injury, unlawful acts, fighting and epilepsy.	Improper use of stimulants or narcotics, immoral practices, venereal diseases, voluntary self-injury, unlawful acts, and fighting.	Improper use of stimulants or narcotics, immoral practices, venereal diseases, voluntary self - injury, unlawful acts, and fighting.

Special examinations were made more frequently when necessary. A regular health bulletin and program were maintained. Railroad B provided free examinations to all employees when desired. The members of organization C had the nursing service of the insurance company available at the larger stations. Railroad D provided first aid and physical examinations; its organization provided "full medical benefits." Railroad E had a hospital unit for accidents and periodic examinations of train operators every 2 years. Finally, railroad F had rules requiring medical examinations every 3 years of workers under 50 years of age, and once a year of older workers.

The population exposed.—About 60,000 white male workers constitute the exposed population. The approximate percentage distribution of the exposed population by railroad is as follows: A, 42 percent; B, 10 percent; C, 15 percent; D, 17 percent; E, 10 percent; and F, 5 percent. During the 5-year period each worker was exposed on the average for approximately 50 months. The number and percent of the person-years of exposure associated with each one of 6 age groups are shown in the following table, the ages being as of July 1, 1932:

Item	Total person-years, known ages	Less than 25 years	25–34	35–44	45–54	55–64	65 and over
Number	245,786	6,910	49,163	77,094	71,364	37,084	4,171
Percent	100.0	2.81	20.00	31.37	29.03	15.09	1.70

Disabilities classified according to the relation of their onset and termination to the period under observation.—With respect to onset and termination, the disabilities suffered by the workers logically fall into 3 groups: First, those whose onset, and termination in recovery or death, occurred during the study period, 1930–34; second, those whose onset occurred during the study period but whose termination is unknown; and, third, those whose onset occurred prior to the beginning of the study period and continued into or beyond it. The disabilities constituting the first and second groups are defined as *cases*, and those entering the third group are designated *illnesses*. In the 3 groups there were, respectively, 30,612 cases, 1,882 cases, and 1,296 illnesses. Thus for the purposes of this report, *case* refers to a disability which began during the study period and lasted longer than the waiting period while a disability which began prior to the study period was not considered a case but, for purposes of differentiation, an *illness*. A *relapse* of a case or of an illness was considered a part of the case or illness which gave rise to the relapse.

Days of disability.—Days of disability include only those days of disability that occurred within the study period. Thus the days of disability arising from an illness are represented only by the calendar days of disability included within the study period; similarly in the instance of a disability lasting beyond the study period, the days disabled are represented by the number of calender days disabled during the study period. The days of disability from a relapse were added to the days of disability from the case or illness which gave rise to the relapse. Days of disability caused by an indisposition not lasting longer than the waiting period were disregarded. Furthermore, days of disability caused by an indisposition which terminated in death before the end of the waiting period were likewise disregarded. To remove a possible ambiguity it should be stated that the days of disability connected with a case always include the days entering a waiting period. With the foregoing explanatory remarks in mind, the present 5-year experience yielded over 3.3 million days of disabling illness of which over 1.5 million were accounted for by the 30,612 cases beginning and ending in the study period, over 1 million by the 1,882 cases beginning but not ending in the study period, and over 0.5 million by the 1,296 illnesses, that is, by disabilities beginning prior to the study period and continuing into, or beyond it.

Average daily percentage of employees disabled, and annual number of days of disability per employee.—The average daily percentage of employees disabled varied according to age group from 1.2 at ages less than 25 years to 10.7 at ages 65 years and over. At all ages the corresponding percentage was 3.7. The following table gives the percentages by age group and the data from which they were calculated. The total days of disability includes all recorded days of disability resulting from cases as well as from illnesses. It will be observed that the percentages increase with age in an orderly manner. A semilogarithmic representation of the percentages against age group shows the increasing trend to be approximately straight, indicating that the percentages increase at an approximately uniform rate.

Age group in years	(1) Total days of disability	(2) Number of person-years of disability	(3) Number of person-years of exposure	(4) Average daily percentage of employees disabled (2)÷(3)	(5) Annual number of days of disability per employee (1)÷(3)
All ages	3,339,814	9,150	246,383	3.7	13.6
Less than 25	20,484	81	6,910	1.2	4.3
25–34	341,505	936	49,163	1.9	6.9
35–44	752,599	2,062	77,094	2.7	9.8
45–54	1,014,148	2,778	71,364	3.9	14.2
55–64	1,033,620	2,832	37,084	7.6	27.9
65 and over	163,222	447	4,171	10.7	39.1
Unknown	5,236	14	597	2.4	8.8

The table also gives the annual number of days of disability per employee. This rate increased in an orderly manner from 4.3 days at ages less than 25 years to 39.1 days at ages 65 years and over; at all ages the rate was 13.6.

Frequency of disabling cases beginning and ending during 1930–34.—The 30,612 disabling cases that began, and ended in recovery or death, during the study period are shown distributed by age group and duration in table 2. The table also includes the calculated annual number of cases per 1,000 white males by age group and duration. The material is represented graphically in figure 1. The figure shows the behavior of the incidence of cases of different durations as age increases. It is of interest to observe that with respect to increasing age the incidence of cases lasting 8–14 days is approximately level, and that as the case-duration increases in magnitude the incidence falls lower and lower in an orderly manner. With this gradual falling of the incidence, however, there is a gradual increase in the slope of the age trend. Thus, to take the extremes, the almost level trend of the 8–14 day cases fluctuates about approximately 40 cases per 1,000 white males per year, and the trend of the 373 day and over cases rapidly rises from 0.4 of a case at less than 25 years of age to 7.2 cases at 65 years and over.

TABLE 2.—*Frequency of disabling sickness and nonindustrial accidents of specified duration among approximately 60,000* [1] *white male railroad employees of different age groups; cases beginning, and ending in recovery or death, during 1930 to 1934, inclusive*

Person-years of membership and duration of cases	Age in years as of July 1, 1932						
	All ages [2]	Less than 25	25–34	35–44	45–54	55–64	65 and over
Person-years of membership	246,383	6,910	49,163	77,094	71,364	37,084	4,171
	Number of cases beginning and ending during 1930 to 1934, inclusive						
Duration of cases in days:							
8 days and over	30,612	674	5,162	8,980	9,224	5,810	704
8–14	9,922	278	1,953	2,993	2,856	1,656	171
15–28	8,862	193	1,470	2,671	2,767	1,539	203
29–49	4,856	104	806	1,384	1,474	969	109
50–98	3,815	63	578	1,110	1,171	788	95
99–189	1,705	23	204	477	502	432	66
190–372	880	10	99	207	285	247	30
373 days and over	572	3	52	138	169	179	30
	Annual number of cases per 1,000 white males						
Duration of cases in days:							
8 days and over	124.2	97.5	105.0	116.5	129.3	156.7	168.8
8–14	40.3	40.2	39.7	38.8	40.0	44.7	41.0
15–28	35.9	27.9	29.9	34.6	38.8	41.5	48.7
29–49	19.7	15.1	16.4	18.0	20.7	26.1	26.1
50–98	15.5	9.1	11.8	14.4	16.4	21.3	22.8
99–189	6.9	3.3	4.1	6.2	7.0	11.6	15.8
190–372	3.6	1.5	2.0	2.7	4.0	6.7	7.2
373 days and over	2.3	.4	1.1	1.8	2.4	4.8	7.2

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[1] The approximate average number of months of membership per person in a sick benefit organization was 50.

[2] Includes some cases of persons of unknown age.

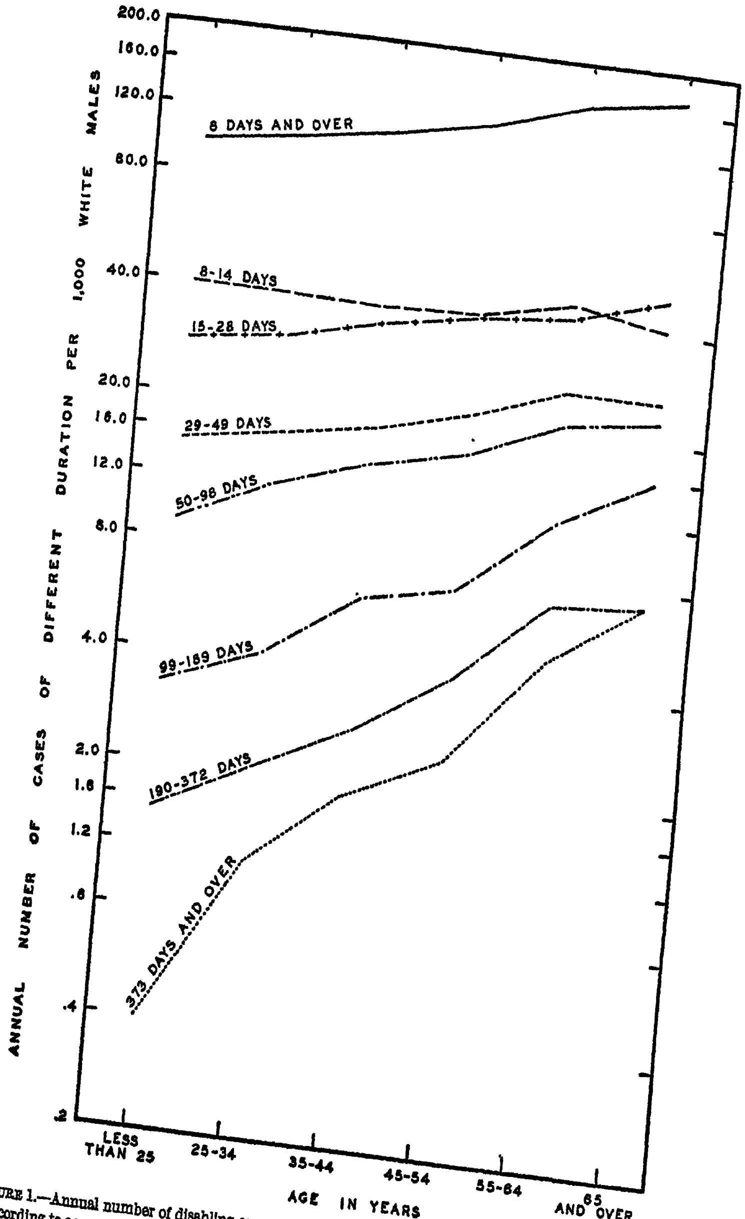

FIGURE 1.—Annual number of disabling cases of sickness and nonindustrial accidents of different duration according to age group. Disabling cases began, and ended in recovery or death, during 1930–34, inclusive, lasted 8 calendar days or longer, and occurred among approximately 60,000 white male railroad employees. (Logarithmic vertical scale.)

Disabling cases beginning and ending during 1930–1934: (A) Duration distribution of cases occurring in different age groups, and (B) age distribution of cases of different duration.—The percentage distribution in each age group of the durations of disabling cases beginning and ending during the study period is shown in section A of table 3, and graphically in figure 2A. Thus 41 percent of the cases occurring at ages less than 25 years were 8–14 days in duration and it will be observed that this percentage gradually decreases as age increases, dropping to 24 percent at ages 65 years and over. Cases of 8–14 days in duration constitute the largest percentage in each age group with the exception of the group 65 years and over in which instance cases 15–28 days in length yield the highest percentage. The percentages associated with cases of duration 15–28 days and 29–49 days vary slightly about the respective percentages for all ages. However, the percentages for the cases with durations of 50 days or more, and particularly those of duration greater than 98 days, increase markedly with increasing age.

TABLE 3.—*(A) Percentage duration distribution of disabling sickness and nonindustrial accidents occurring in different age groups; and (B) percentage age distribution of disabling sickness and nonindustrial accidents of different duration. Cases occurring among approximately 60,000* [1] *white male railroad employees, beginning, and ending in recovery or death, during 1930 to 1934, inclusive. (Percentages based on data in table 2)*

Duration of cases	Age in years as of July 1, 1932						
	All ages	Less than 25	25–34	35–44	45–54	55–64	65 and over
	(A) Percent of cases						
8 days and over	100.00	100.00	100.00	100.00	100.00	100.00	100.00
8–14	32.41	41.25	37.83	33.33	30.96	28.50	24.29
15–28	28.95	28.64	28.48	29.74	30 00	26.49	28.84
29–49	15.86	15.43	15.61	15.41	15.98	16.68	15.48
50–98	12.46	9.35	11.20	12.36	12.70	13.56	13.49
99–189	5.57	3.41	3.95	5.31	5.44	7.44	9.38
190–372	2.88	1.48	1.92	2.31	3.09	4.25	4.26
373 days and over	1.87	.44	1.01	1.54	1.83	3.08	4.26
	(B) Percent of cases						
8 days and over	100.00	2.21	16.89	29.39	30.19	19.02	2.30
8–14	100.00	2.81	19.71	30.21	28.83	16.71	1.73
15–28	100.00	2.18	16.62	30.21	31.29	17.40	2.30
29–49	100.00	2.15	16.63	28.56	30.42	19.99	2.25
50–93	100 00	1.66	15.19	29.17	30.77	20.71	2.50
99–189	100.00	1.35	11.97	27.99	29.46	25.35	3.88
190–372	100.00	1.14	11.27	23.58	32.46	28.13	3.42
373 days and over	100.00	.52	9.11	24.17	29.60	31.35	5.25

[1] See footnote 1, table 2.

Table 3 also shows, in section B, the age composition of cases of different duration; the percentages are shown graphically in figure 2B. The percentage age distribution of the exposed population giving rise to the cases may be represented approximately by the bar representing the percentage age distribution of employees with cases 8–14 days in duration. When the percentage age distributions of the different case durations are compared with the percentage age distribution of the exposed population it will be observed that the percentages of cases in the older age groups increase with increasing duration while the percentages of cases in the younger age groups decrease with increasing duration.

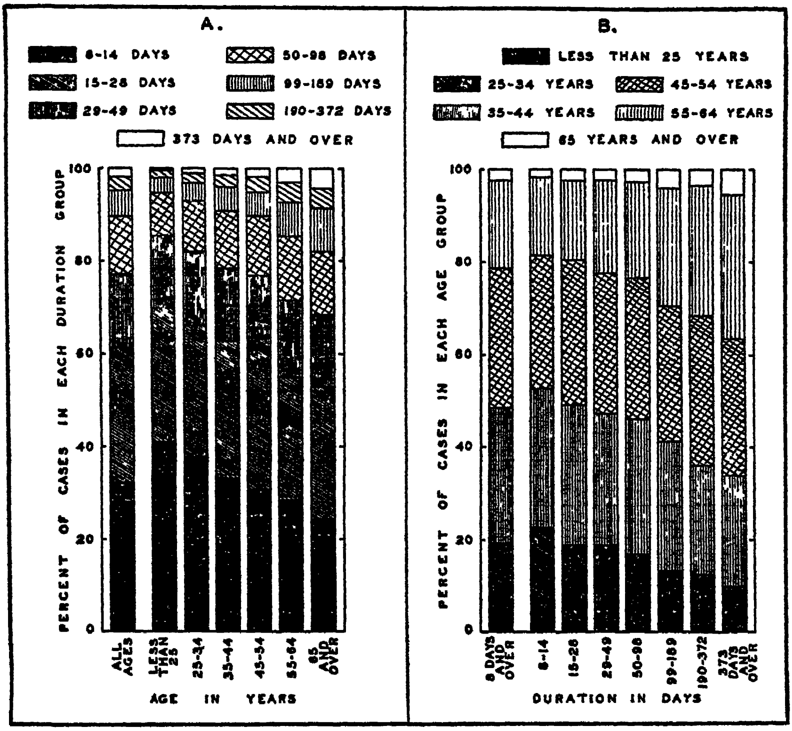

FIGURE 2.—Disabling cases began, and ended in recovery or death, during 1930–34, inclusive, lasted 8 calendar days or longer, and occurred among approximately 60,000 white male railroad employees. (A) Percentage duration distribution of disabling cases of sickness and nonindustrial accidents according to age group. (B) Percentage age distribution of disabling cases of sickness and nonindustrial accidents according to duration of case. (The bar representing the percentage age distribution of employees with disabling cases 8–14 days in duration is approximately equivalent to a bar representing the percentage age distribution of the exposed population; see text for specific percentages.)

It is of interest to examine figures 2A and 2B from another point of view, that is, instead of reading from left to right, as was done above, let the bars of the figures be read in the direction of the axis of case percentages. Such a reading of figure 2A immediately reveals that the variation of case percentages with increasing case-duration may be described by a J-shaped family of age curves while a similar reading of figure 2B shows that the variation of case percentages with increasing age may be described by an inverted U-shaped family of duration curves. Thus, more specifically, it will be observed in figure 2A that the percentages of cases carried by each bar, each bar representing an age group, become gradually smaller as case duration increases; and in figure 2B the percentages of cases carried by each bar, each bar representing a specific case duration, begin relatively low, reach a maximum, and then decline, as age increases. The interesting fact in connection with the family of duration curves flowing from figure 2B is that the curves for the durations of 99 days and longer are skewed to the right, indicating, as anticipated, that the longer cases are associated with the older age groups 55–64 years, and 65 years and over.

TABLE 4.—*Frequency of disabling sickness and nonindustrial accidents of specified duration during 1930–34 among approximately 60,000* [1] *white male railroad employees of different age groups; cases beginning during 1930 to 1934, inclusive, with termination unknown*

Person-years of membership and duration of cases	Age in years as of July 1, 1932						
	All ages [2]	Less than 25	25–34	35–44	45–54	55–64	65 and over
Person-years of membership	246,383	6,910	49,163	77,094	71,364	37,084	4,171
	Number of cases beginning during 1930 to 1934, inclusive, with termination unknown						
Duration of cases in days:							
Total	1,882	17	153	376	491	661	181
1–7 [3]	104	1	10	23	36	30	4
8–14	132	4	15	45	36	29	3
15–28	173	3	21	40	54	47	7
29–49	116	2	12	30	27	34	10
50–98	177	1	10	28	47	64	26
99–189	170	----------	14	34	52	51	19
190–372	288	2	17	42	65	97	65
373 days and over	722	4	54	134	174	309	47
	Annual number of cases per 1,000 white males						
Duration of cases in days:							
Total	7.6	2.5	3.1	4.9	6.9	17.8	43.4
1–7 [3]	.4	.1	.2	.3	.5	.8	.9
8–14	.5	.6	.3	.6	.5	.8	.7
15–28	.7	.4	.4	.5	.8	1.3	1.7
29–49	.5	.3	.2	.4	.4	.9	2.4
50–98	.7	.2	.2	.4	.7	1.7	6.2
99–189	.7	----------	.3	.5	.7	1.4	4.6
190–372	1.2	.3	.4	.5	.9	2.6	15.6
373 days and over	2.9	.6	1.1	1.7	2.4	8.3	11.3

[1] See footnote 1, table 2.

[2] Includes some cases of persons of unknown age.

[3] Cases which began within 7 days of the end of the period 1930 to 1934, inclusive.

Frequency of disabling cases beginning during 1930–34 but with termination unknown.—There were 1,882 disabling cases that began during the study period and whose termination is unknown. Of these cases, 722 lasted 373 days and over. The number of the cases and their annual frequency by age group and duration during the study period are shown in table 4. Of interest are the frequencies in the age groups

55–64 years, and 65 years and over, the frequency of cases of all durations being in the former age group over twice the frequency for all ages, and in the latter age group the corresponding figure is almost 6. For cases of specific duration, particularly the longer ones, of the same age groups (55–64 years, and 65 years and over) the corresponding figures are unusually high, and strikingly so in the older age group. Thus the frequency of cases lasting 190–372 days in the age group 65 years and over is 13 times the corresponding frequency for all ages.

TABLE 5.—*Frequency of disabling sickness and nonindustrial accidents of specified duration among approximately 60,000* [1] *white male railroad employees of different age groups; cases beginning during the period 1930 to 1934, inclusive. (Tables 2 and 4 combined)*

Person-years of membership and duration of cases	Age in years as of July 1, 1932						
	All ages [2]	Less than 25	25–34	35–44	45–54	55–64	65 and over
Person-years of membership	246, 383	6, 910	49, 163	77, 094	71, 364	37, 084	4, 171
	Number of cases which began during 1930 to 1934, inclusive [3]						
Duration of cases in days:							
Total	32, 494	691	5, 315	9, 356	9, 715	6, 471	885
1–7 [4]	104	1	10	23	36	30	4
8–14	10, 054	282	1, 968	3, 038	2, 892	1, 685	174
15–28	9, 035	196	1, 401	2, 711	2, 821	1, 586	210
29–49	4, 972	106	818	1, 414	1, 501	1, 003	119
50–98	3, 992	64	588	1, 138	1, 218	852	121
99–189	1, 875	23	218	511	554	483	85
190–372	1, 168	12	116	249	350	344	95
373 days and over	1, 294	7	106	272	343	488	77
	Annual number of cases per 1,000 white males						
Duration of cases in days:							
Total	[5] 131. 9	100. 0	108. 1	121. 4	136. 1	174. 5	212. 2
1–7 [4]	. 4	. 1	. 2	. 3	. 5	. 8	. 9
8–14	40. 8	40. 8	40. 0	39. 4	40. 5	45. 4	41. 7
15–28	36. 7	28. 4	30. 3	35. 2	39. 5	42. 8	50. 4
29–49	20. 2	15. 4	16. 6	18. 4	21. 0	27. 0	28. 5
50–98	16. 2	9. 3	12. 0	14. 8	17. 1	23. 0	29. 0
99–189	7. 6	3. 3	4. 4	6. 6	7. 8	13. 0	20. 4
190–372	4. 7	1. 7	2. 4	3. 2	4. 9	9. 3	22. 8
373 days and over	5. 3	1. 0	2. 2	3. 5	4. 8	13. 2	18. 5

[1] See footnote 1, table 2.
[2] Includes some cases of persons of unknown age.
[3] Includes cases which did not end during the period 1930 to 1934, inclusive, as well as those that did end.
[4] Cases which began within 7 days of the end of the period 1930 to 1934, inclusive.
[5] The rates in this column (rate for duration 1-7 days excluded) when adjusted to the age distribution of gainful white male workers of the United States for 1930 read, respectively, 123.9, 40.7, 34.5, 19.0, 14.6, 6.6, 4.2, and 4.3.

Frequency of disabling cases beginning during 1930–34 regardless of termination.—To obtain the incidence of disabilities it is obviously necessary to add the number of cases that began and ended in the study period to those beginning in the period but with termination unknown. This addition has been performed, and the results are shown in table 5. As implied above the effect of the combining of the two categories of cases is largely reflected by the age groups 55–64 years, and 65 years and over. The incidence for all ages and all durations is increased from 124 to 132 cases per 1,000 males per year. It is of interest to compare the latter frequency with those for other industries. The appropriate data (*2*) are presented in the following tabulation:

Public Utility, Company A	153.2
Railroads, this report	131.9
Public Utility, Company B	110.0
Public Utility, Company C	105.8
Miscellaneous, Company A	97.6
Miscellaneous, Company B	84.7

The cases include those occurring among males, and only of duration of 8 days and longer. With the exception of the rate for Public Utility, Company A, all rates are based on the period 1930–34 inclusive, the exception covering the period 1933–37. The exposed populations, other than the railroad workers, include some Negroes. Because the necessary data are unavailable, the rates as given are not adjusted for possible differences in the age distributions of the populations exposed. The rate for the railroads, however, when adjusted to the age of gainful white male workers of the United States for 1930, becomes 123.9.

TABLE 6.—*Frequency by duration of disabling sickness and nonindustrial accidents among approximately 60,000*[1] *white male railroad employees of different age groups; illnesses beginning prior to 1930 with termination during or after 1930 to 1934, inclusive*

Person-years of membership, and duration of illnesses during 1930–34	Age in years as of July 1, 1932						
	All ages[2]	Less than 25	25–34	35–44	45–54	55–64	65 and over
Person-years of membership	246,383	6,910	49,163	77,094	71,364	37,084	4,171
	Number of illnesses which began prior to 1930 with termination during or after 1930 to 1934, inclusive						
Duration of illnesses in days:							
8 days and over	1,296	13	151	250	374	377	130
8–14	77	2	18	29	14	12	2
15–28	98	2	12	19	29	28	8
29–49	112	1	21	21	30	29	10
50–98	153	2	22	33	38	39	19
99–189	133	4	14	19	29	38	29
190–372	111	2	16	17	29	27	20
373 days and over	612	----------	48	112	205	204	42
	Annual number of illnesses per 1,000 white males						
Duration of illnesses in days:							
8 days and over	5.3	1.9	3.1	3.2	5.2	10.2	31.2
8–14	.3	.3	.4	.4	.2	.3	.5
15–28	.4	.3	.2	.2	.4	.8	1.9
29–49	.5	.1	.4	.3	.4	.8	2.4
50–98	.6	.3	.5	.4	.5	1.1	4.6
99–189	.5	.6	.3	.2	.4	1.0	6.9
190–372	.5	.3	.3	.2	.4	.7	4.8
373 days and over	2.5	----------	1.0	1.5	2.9	5.5	10.1

[1] See footnote 1, table 2.

[2] Includes some cases of persons of unknown age.

Frequency of disabling illnesses during 1930–34.—As indicated previously, there were 1,296 disabilities, designated *illnesses,* which began prior to the study period. Of these illnesses, according to the appendix table, 355 continued throughout the 5-year period, and as indicated in table 6, almost one-half lasted 373 days or over. Table 6 shows the illnesses classified according to age group by duration. It will be observed that the rate for all ages and all durations is 5.3 illnesses per 1,000. With respect to specific ages this rate is exceeded only by the corresponding rates at ages 55–64 years, and 65 years and over, being almost twice as large in the first instance and almost six times as large in the second. At ages 65 years and over there is a striking increase of the frequency with duration.

SUMMARY

This report presents the frequency of recorded disabilities of 8 calendar days or longer from sickness and nonindustrial accidents among approximately 60,000 white male railroad employees. The disabilities occurring during 1930–34, inclusive, are classified according to age group and duration. All of the supporting data were transcribed from the medical records of the sick benefit organizations connected with six railroads.

Because of certain limitations imposed by the regulations governing the sick benefit organizations it is probable that the disabling sickness frequencies as presented are lower than those that actually existed.

There were recorded 30,612 disabilities whose onset, and termination in recovery or death, occurred during 1930 to 1934, inclusive. There were 1,882 disabilities that began during the same period but whose termination was unknown. In addition, there were 1,296 disabilities whose onset occurred prior to 1930 and of which number 355 continued beyond 1934.

The annual number of disabilities beginning in the study period per 1,000 white males was found to be 132 (adjusted for age, 124). When this frequency was made specific for age group the resulting frequencies ranged from 100 at less than 25 years of age to 212 at 65 years and over.

With respect to duration, the disabilities beginning and ending in the study period showed that with increasing age the incidence of disabilities lasting 8–14 calendar days was approximately constant, and that as the duration increased in magnitude, the incidence fell lower and lower in an orderly manner. With this falling of the incidence there was a gradual increase in the slope of the age trend.

A distribution of disabilities by age group, and according to duration of greater detail than that used in the report is given in the appendix.

REFERENCES

(*1*) Sayers, R. R., Kroeger, G., and Gafafer, W. M.: (1937) General aspects and functions of the sick benefit organization. Pub. Health Rep., 52: 1563–1580. (Reprint no. 1874.)

(*2*) Unpublished data from the Division of Industrial Hygiene.

APPENDIX TABLE

Frequency of disabling sickness and nonindustrial accidents lasting 8 calendar days or longer by duration and age, and occurring among approximately 60,000 white male railroad employees, 1930 to 1934, inclusive*

Duration in days during 1930–34	Cases beginning, and ending in recovery or death, during 1930 to 1934, inclusive							Cases beginning during 1930 to 1934, inclusive, with termination unknown							Illnesses beginning prior to 1930 with termination during or after 1930 to 1934, inclusive						
	Total**	Age in years as of July 1, 1932						Total**	Age in years as of July 1, 1932						Total**	Age in years as of July 1, 1932					
		Less than 25	25–34	35–44	45–54	55–64	65 and over		Less than 25	25–34	35–44	45–54	55–64	65 and over		Less than 25	25–34	35–44	45–54	55–64	65 and over
Total	[58] 30,612	674	5,162	8,980	9,224	5,810	704	[3] 1,882	17	153	376	491	661	181	[1] 1,296	13	151	250	374	377	130
1–7***	-----	-----	-----	-----	-----	-----	-----	104	1	10	23	36	30	4	-----	-----	-----	-----	-----	-----	-----
8	1,402	42	249	455	406	229	21	28	1	4	11	7	4	1	11	1	5	-----	2	3	-----
9	[3] 1,549	38	283	462	468	264	31	17	-----	3	10	2	1	1	8	-----	3	3	2	-----	-----
10	[1] 1,603	45	336	480	440	275	26	22	-----	2	7	8	5	-----	4	-----	-----	2	1	1	-----
11	[3] 1,481	47	294	442	447	225	23	19	1	3	5	4	6	-----	2	-----	-----	1	1	-----	-----
12	[3] 1,356	36	270	413	365	249	20	19	1	2	5	3	8	-----	21	-----	3	10	5	2	1
13	[1] 1,194	32	245	365	338	192	21	17	1	-----	4	7	4	1	18	1	3	7	1	6	-----
14	[4] 1,337	38	276	376	392	222	29	10	-----	1	3	5	1	-----	13	-----	4	6	2	-----	1
15	[2] 988	31	170	302	288	185	10	33	-----	3	12	8	9	1	19	1	7	2	5	2	2
16	[2] 935	20	156	303	284	147	23	15	-----	1	4	6	4	-----	8	-----	-----	1	1	6	-----
17	[1] 894	12	160	289	270	139	23	15	1	2	4	4	4	-----	5	-----	-----	3	-----	2	-----
18	[1] 769	22	155	232	217	135	7	[1] 14	-----	2	1	2	6	2	1	-----	-----	1	-----	-----	-----
19	[1] 692	14	117	216	214	113	17	18	-----	2	3	7	4	2	15	-----	1	2	9	2	1
20	[1] 662	14	112	200	216	106	13	7	-----	1	1	2	3	-----	5	-----	-----	3	2	-----	-----
21	[2] 724	13	110	227	235	121	16	13	-----	3	3	3	4	-----	5	-----	2	1	-----	2	-----
22	527	15	81	151	167	102	11	8	-----	2	2	2	2	-----	6	-----	-----	2	2	1	1
23	[4] 521	9	77	143	174	99	15	6	1	1	3	1	-----	-----	9	-----	1	1	4	3	-----
24	462	12	77	145	129	78	21	11	-----	1	1	7	1	1	3	-----	-----	1	-----	2	-----
25	440	7	73	120	147	86	7	6	-----	-----	-----	2	3	1	1	-----	-----	-----	-----	1	-----
26	[2] 446	13	66	123	155	71	16	13	1	2	3	4	3	-----	11	-----	1	2	4	2	2
27	400	5	65	105	145	71	9	6	-----	-----	1	2	3	-----	6	-----	-----	-----	1	3	2
28	[3] 402	6	51	115	126	86	15	8	-----	1	2	4	1	-----	4	1	-----	-----	1	2	-----
29–35	[2] 2,151	49	341	620	679	422	38	[1] 53	2	3	15	11	15	6	49	1	10	7	15	10	6
36–42	[5] 1,527	27	253	426	472	307	37	30	-----	4	9	9	7	1	39	-----	7	11	8	11	2
43–49	[3] 1,178	28	212	338	323	240	34	33	-----	5	6	7	12	3	24	-----	4	3	7	8	2
50–56	920	21	136	271	273	194	25	33	-----	2	6	11	10	4	16	-----	2	6	7	1	-----
57–63	[3] 721	7	111	218	231	139	12	21	-----	2	2	7	6	4	40	2	7	6	10	11	4
64–70	[1] 561	11	82	155	179	118	15	19	-----	1	4	3	10	1	16	-----	1	4	2	6	3

71–77	^{3} 456	6	71	131	140	95	11	^{1} 24			6	7	7	8	18		1	3	4	5	5
78–84	^{3} 405	9	59	112	136	79	8	19	1	1		7	6	4	18		5	3	3	5	2
85–91	^{2} 362	5	54	99	105	85	17	30		2	6	8	13	6	29		5	7	9	4	4
92–98	390	4	65	124	107	78	12	31		2	4	9	12	4	16		1	4	3	7	1
99–105	297	7	38	87	90	61	14	13			4	3	5	1	18		3	3	2	4	6
106–112	214	5	20	70	55	59	5	12			2	5	4	1	15		2	3	3	5	2
113–119	190	2	22	58	61	41	6	17		2	3	6	4	2	6			2	1	3	
120–126	142		22	38	40	39	3	18		1	6	5	4	2	16	1	2	5	2	5	1
127–133	151		20	39	48	39	5	16		3	1	3	7	2	11	1	1		5	1	3
134–140	128	1	13	36	34	40	4	13		1	1	5	4	2	11				1	4	6
141–147	^{1} 109		12	23	39	23	11	17		1	7	2	6	1	10		2	2	3	2	1
148–154	91	2	16	25	24	20	4	14		1	1	9	1	2	16	1	1		4	5	5
155–161	83		17	19	23	23	1	11		1	1	5	2	2	5			2	1	1	1
162–168	88	1	11	20	29	21	6	7			1	2	3	1	6	1			3	1	1
169–175	61	2	2	23	13	20	1	12		1	1	4	4	2	7			1	2	2	2
176–182	65	1	6	15	20	21	2	16		3	4	2	6	1	8		2	1	2	3	
183–189	86	2	5	24	26	25	4	4			2	1	1		4		1			2	1
190–196	59	1	7	12	18	19	2	12			4	4	2	2	9	1		1	1	2	4
197–203	70	1	6	22	20	18	3	8		1	2	2	3		5				3	2	
204–210	57		8	17	15	16	1	13			2	3	7	1	7			1	3	3	
211–217	36		4	7	10	13	2	10			3	3	3	1	11			1	4	2	4
218–224	37		2	9	16	8	2	9			2	1	5	1	5		1	1	1	1	1
225–231	41		4	6	16	13	2	5					4	1	3						3
232–238	40		7	13	12	8		6		1	1	2	1	1	4			2	1	1	
239–245	38		8	15	11	9		7			3	1	3		7		4	2			1
246–252	33		3	11	12	6	1	7		1	1	2	3		4		2	1	1		
253–259	31		4	2	15	8	2	20		3	3	5	9		3		1		2		
260–266	32	1	4	8	12	7		8			2	1	3	2	6			2	1	3	
267–273	25		4	7	7	7		10		2	1	2	3	2	5		2		3		
274–280	^{1} 27	1	3	5	11	4	2	11			1	3	5	2	1		1				
281–287	23		2	6	7	6	2	9			1	2	5	1	4		1			3	
288–294	20		1	8	7	7	2	3				2	1		1			1			
295–301	35	1	7	7	9	8	3	8		1	2	2	2	1	4		1			1	2
302–308	25	1	1	2	14	7		8				3	4	1	6		2	1	2		1
309–315	29	1	2	6	13	7		7			2	2	3		2	1			1		
316–322	34		3	7	14	10		14		5	2	1	5	1	4				2	1	1
323–329	22		2	6	10	3	1	14			2	5	6	1	1					1	
330–336	23		3	7	3	10		10	1	1	1	1	4	2	5			1	1	2	1
337–343	19	1	8	5	6	4		13	1	1	4	2	5		3				2		1
344–350	31	1	6	6	4	13	1	9				3	3	3	5			3		2	
351–357	28		8	5	10	10		6				5	1		1					1	
358–364	29	1	1	6	8	11	2	7			3	1	1	2	3				1	1	1
365–392	^{1} 95	1	14	20	25	24	10	76		2	2	11	16	45	7		2		3	2	

*The approximate average number of months of membership per person in a sick benefit organization was 50.

**Includes a certain number of cases of persons of unknown age, as indicated by superscripts in the column. Thus, ^{3} 1,549 indicates that of 1,549 cases lasting 9 days, 3 were cases in persons of unknown age.

***See footnote 4, table 5.

Frequency of disabling sickness and nonindustrial accidents lasting 8 calendar days or longer by duration and age, and occurring among approximately 60,000 white male railroad employees, 1930 to 1934, inclusive*—Continued

Duration in days during 1930-34	Cases beginning, and ending in recovery or death, during 1930 to 1934, inclusive							Cases beginning during 1930 to 1934, inclusive, with termination unknown							Illnesses beginning prior to 1930 with termination during or after 1930 to 1934, inclusive						
	Total**	Age in years as of July 1, 1932						Total**	Age in years as of July 1, 1932						Total**	Age in years as of July 1, 1932					
		Less than 25	25-34	35-44	45-54	55-64	65 and over		Less than 25	25-34	35-44	45-54	55-64	65 and over		Less than 25	25-34	35-44	45-54	55-64	65 and over
393-420	56	1	1	17	17	18	2	30	-------	1	3	3	15	8	13	-------	2	3	2	5	1
421-448	59	-------	10	11	17	18	3	33	-------	2	9	5	13	4	9	-------	-------	-------	2	4	3
449-476	52	-------	7	11	13	19	2	24	-------	-------	4	1	15	4	16	-------	3	3	3	5	2
477-504	23	-------	2	6	4	11	-------	14	-------	1	2	2	7	2	11	-------	1	2	5	3	-------
505-532	27	-------	1	8	9	6	3	17	-------	-------	5	6	6	-------	3	-------	1	-------	2	-------	-------
533-560	24	-------	2	3	6	12	1	19	-------	2	5	6	6	-------	7	-------	-------	2	1	1	3
561-588	29	1	3	7	6	9	3	19	-------	2	5	3	9	-------	6	-------	1	-------	-------	5	-------
589-616	17	-------	1	4	7	5	-------	14	-------	2	1	4	4	3	3	-------	1	-------	2	-------	-------
617-644	22	-------	2	7	5	6	2	15	-------	-------	1	6	6	2	8	-------	-------	2	3	-------	3
645-672	10	-------	-------	2	6	2	-------	22	-------	5	-------	4	12	1	7	-------	1	-------	1	2	3
673-700	17	-------	1	5	7	4	-------	17	1	2	5	2	7	-------	5	-------	-------	1	3	-------	1
701-728	18	-------	-------	6	5	7	-------	15	1	1	2	2	8	1	8	-------	-------	1	-------	4	3
729-756	12	-------	2	4	3	1	2	24	-------	1	3	4	14	2	10	-------	1	3	2	2	2
757-784	[1]14	-------	1	3	3	4	2	16	-------	-------	3	3	7	3	4	-------	1	1	1	-------	1
785-812	10	-------	-------	5	1	4	-------	10	-------	1	3	1	5	-------	4	-------	-------	-------	2	2	-------
813-840	8	-------	-------	1	6	1	-------	12	-------	3	1	2	6	-------	10	-------	-------	-------	3	6	1
841-868	7	-------	2	1	2	2	-------	8	-------	-------	3	-------	3	2	5	-------	-------	1	1	2	1
869-896	6	-------	-------	-------	2	4	-------	7	-------	-------	1	3	3	-------	4	-------	1	-------	1	2	-------
897-924	12	-------	2	1	6	3	-------	16	-------	1	3	2	9	1	1	-------	-------	-------	1	-------	-------
925-952	9	-------	-------	3	2	4	-------	28	-------	3	2	6	15	2	4	-------	1	2	-------	1	-------
953-980	4	-------	-------	1	1	2	-------	24	-------	2	4	7	11	-------	2	-------	-------	-------	-------	1	1
981-1,008	7	-------	-------	2	2	3	-------	21	-------	2	7	6	6	-------	7	-------	-------	1	2	3	1
1,009-1,036	5	-------	-------	3	-------	2	-------	15	-------	1	4	8	2	-------	3	-------	-------	-------	2	1	-------
1,037-1,064	10	-------	4	2	2	1	1	20	-------	-------	4	4	12	-------	1	-------	1	-------	-------	-------	-------
1,065-1,092	1	-------	-------	1	-------	-------	-------	16	-------	-------	2	6	8	-------	3	-------	-------	1	1	1	-------
1,093-1,120	3	-------	-------	-------	1	2	-------	16	-------	2	8	3	3	-------	8	-------	-------	2	2	3	1
1,121-1,148	5	-------	-------	2	2	1	-------	9	-------	-------	3	3	3	-------	6	-------	2	-------	2	1	1
1,149-1,176	9	-------	-------	4	1	4	-------	11	-------	1	1	5	3	1	2	-------	1	-------	1	-------	-------
1,177-1,204	2	-------	-------	-------	-------	2	-------	15	-------	-------	4	5	6	-------	3	-------	-------	-------	1	2	-------
1,205-1,232	1	-------	-------	-------	-------	1	-------	6	-------	-------	-------	3	3	-------	7	-------	-------	1	2	2	2
1,233-1,260	7	-------	2	1	1	3	-------	5	-------	1	-------	1	3	-------	5	-------	-------	1	3	1	-------
1,261-1,288	8	-------	1	-------	3	3	1	12	-------	-------	5	3	4	-------	6	-------	1	2	2	1	-------
1,289-1,316	5	-------	-------	3	-------	2	-------	4	-------	-------	1	3	-------	-------	4	-------	-------	-------	1	1	2

1,317–1,344	3	---	---	---	2	1	---	17	---	[illegible]	[illegible]	[illegible]	[illegible]	---	[illegible]	---	---	---	---	---	---
1,345–1,372	1	---	---	---	---	1	---	13	---	5	2	3	3	---	1	---	1	---	---	---	---
1,373–1,400	1	---	---	---	---	1	---	10	---	---	1	4	5	---	7	---	---	1	3	3	---
1,401–1,428	3	---	---	---	2	1	---	7	---	1	3	1	2	---	2	---	---	---	---	2	---
1,429–1,456	2	---	---	---	---	2	---	15	---	1	3	7	4	---	4	---	---	1	3	---	---
1,457–1,484	1	---	---	---	1	---	---	13	---	1	4	5	2	1	7	---	---	---	3	4	---
1,485–1,512	1	---	---	---	---	1	---	7	---	1	---	1	4	1	5	---	1	---	1	3	---
1,513–1,540	1	---	---	---	1	---	---	8	---	1	1	1	4	1	1	---	1	---	---	---	---
1,541–1,568	1	---	---	---	---	1	---	10	---	1	---	5	4	---	3	---	1	---	1	1	---
1,569–1,596	1	---	---	---	1	---	---	6	---	1	1	2	2	---	2	---	1	---	---	1	---
1,597–1,624	1	---	---	---	1	---	---	9	---	---	2	4	3	---	2	---	1	---	---	1	---
1,625–1,652	2	---	---	1	1	---	---	6	---	---	---	2	4	---	6	---	---	1	2	3	---
1,653–1,680	1	---	---	---	---	1	---	9	---	---	1	6	2	---	2	---	---	---	---	1	1
1,681–1,708	---	---	---	---	---	---	---	9	---	1	3	---	4	1	1	---	---	---	---	1	---
1,709–1,736	---	---	---	---	---	---	---	6	---	---	2	3	---	1	1	---	---	---	---	---	1
1,737–1,764	---	---	---	---	---	---	---	8	1	---	---	1	6	---	5	---	---	---	2	2	1
1,765–1,792	---	---	---	---	---	---	---	5	1	---	---	1	3	---	5	---	---	---	1	4	---
1,793–1,820	---	---	---	---	---	---	---	6	---	1	1	---	3	1	1	---	---	---	1	---	---
1,821–1,825	---	---	---	---	---	---	---	2	---	---	---	---	2	---	---	---	---	---	---	---	---
1,826	---	---	---	---	---	---	---	---	---	---	---	---	---	---	[1] 355	---	22	80	131	115	6

See footnote on p. 571.

OCCURRENCE OF TULARAEMIA IN THE RABBIT TICK (*HAEMAPHYSALIS LEPORIS-PALUSTRIS*) IN ALASKA[1]

By CORNELIUS B. PHILIP, *Entomologist*, and R. R. PARKER, *Director, Rocky Mountain Laboratory, United States Public Health Service*

This paper reports the recovery of *Bacterium tularense* from naturally infected rabbit ticks, *Haemaphysalis leporis-palustris*, off varying hares (snowshoe rabbits) taken in the vicinity of Fairbanks, Alaska. This is the first evidence of the occurrence of tularaemia in this territory.

The most northern point in North America from which tularaemia has been recognized previously is Athabasca, Province of Alberta, Canada. It has been reported from just below the Arctic Circle in both Europe and Asia; namely, from Hattfjelldal, Norway, and the Tobolsk district in the lower Ob River region above Obdorsk, Union of Soviet Socialist Republics.

FIELD NOTES

The senior author (C. B. P.) spent the period July 6 to 15, 1937, collecting rodents, particularly hares, in the vicinity of Fairbanks and along the Steese Highway to Circle. With the exception of one tick found on a hare at "Mile 8" on the Steese Highway, the only tick-infested animals in the area were taken on the so-called "College-loop Farm Road," some 10 to 15 miles northwest of Fairbanks, and the infected ticks came from this restricted locality.

Ticks obtained at this time and others collected subsequently in the same locality by Mr. J. W. Warwick, field assistant of the United States Bureau of the Biological Survey, were forwarded alive to the Rocky Mountain Laboratory, Hamilton, Mont., where they were tested for presence of infectious agents. *Bact. tularense* was recovered from groups of ticks representing three different collections. Two of these were obtained by one of the authors (C. B. P.) in July, the third by Mr. Warwick in August. One of the first two groups consisted of about 75 ticks of all stages, from 5 hares, and the second, of 6 adults, 48 nymphs, and 76 larvae, from one hare. The third comprised 27 nymphs, also from one hare. The last two hosts were each noted to have enlarged spleens, and one an enlarged, rather dark liver. There was no gross evidence of focal necrosis.

LABORATORY OBSERVATIONS

The above 3 groups of ticks were triturated separately in physiologic saline, and each resulting suspension was divided for injection into 2 guinea pigs, in one subcutaneously and in the other intraperitoneally.

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[1] Contribution from the Division of Infectious Diseases, National Institute of Health, Rocky Mountain Laboratory, Hamilton, Mont.

All 6 animals used in these tests died or were killed when moribund. The necropsy findings were characteristic of tularaemia: the spleen was enlarged and showed focal necrosis, as did also the liver in most of the animals; one or both inguinal lymph nodes were enlarged; and, in the subcutaneously inoculated animals, there was induration or caseation at the site of infection. Each of the 3 strains thus isolated was carried through one or more transfers in guinea pigs or rabbits, all animals dying and showing typical gross lesions. The diagnosis of tularaemia was confirmed culturally by Bacteriologist Gordon E. Davis, and a culture of one of the strains was agglutinated to titer by specific rabbit antiserum.

Acknowledgments.—Mr. J. W. Warwick, Prof. Otto Geist, of the University of Alaska, and Mr. Jack White, local game warden, rendered valuable assistance in the collecting of animals.

DEATHS DURING WEEK ENDED MARCH 26, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Mar. 26, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	8,927	9,302
Average for 3 prior years	9,416	
Total deaths, first 12 weeks of year	107,353	123,390
Deaths under 1 year of age	556	595
Average for 3 prior years	600	
Deaths under 1 year of age, first 12 weeks of year	6,506	7,583
Data from industrial insurance companies:		
Policies in force	69,707,502	69,556,759
Number of death claims	13,752	14,220
Death claims per 1,000 policies in force, annual rate	10.3	10.7
Death claims per 1,000 policies, first 12 weeks of year, annual rate	10.1	11.5

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (----) indicate that cases or deaths may have occurred although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Apr. 2, 1938, and Apr. 3, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Apr. 2 1938	Week ended Apr. 3 1937	Week ended Apr. 2 1938	Week ended Apr. 3 1937	Week ended Apr. 2 1938	Week ended Apr. 3 1937	Week ended Apr. 2 1938	Week ended Apr. 3 1937
New England States:								
Maine	1	0	8	1	164	15	1	0
New Hampshire	0	1	----	----	46	53	0	0
Vermont	0	1	----	----	126	2	0	0
Massachusetts	2	3	----	----	326	632	2	11
Rhode Island	0	1	----	----	2	296	1	1
Connecticut	6	2	6	13	32	707	3	1
Middle Atlantic States:								
New York	24	27	[1] 13	[1] 22	3,075	776	8	8
New Jersey	0	10	11	19	1,338	3,728	1	3
Pennsylvania	47	43	----	----	5,714	595	3	11
East North Central States:								
Ohio	33	25	----	20	2,464	584	7	8
Indiana	25	10	13	312	1,189	137	1	7
Illinois	35	45	9	59	5,282	106	1	4
Michigan [3]	13	10	----	2	4,683	78	0	2
Wisconsin	4	1	30	74	3,313	19	1	0
West North Central States:								
Minnesota	4	8	2	1	205	47	0	1
Iowa	3	7	14	8	199	3	1	1
Missouri	16	11	62	110	699	41	2	0
North Dakota	0	0	5	3	87	----	0	0
South Dakota	0	0	----	----	----	4	0	0
Nebraska	0	2	----	----	80	9	0	2
Kansas	5	4	5	8	526	15	1	1
South Atlantic States:								
Delaware	0	9	----	----	15	81	0	1
Maryland [2]	7	15	6	28	50	934	2	10
District of Columbia	5	11	2	----	17	69	0	2
Virginia	16	9	----	----	811	217	1	15
West Virginia	10	5	36	67	653	8	4	8
North Carolina [3]	16	9	21	69	3,026	168	1	4
South Carolina	5	4	218	707	361	38	1	1
Georgia [3]	7	4	----	336	456	----	2	2
Florida [3]	31	4	4	35	801	5	1	12

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Apr. 2, 1938, and Apr. 3, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Apr. 2 1938	Week ended Apr. 3 1937	Week ended Apr. 2 1938	Week ended Apr. 3 1937	Week ended Apr. 2 1938	Week ended Apr. 3 1937	Week ended Apr. 2 1938	Week ended Apr. 3 1937
East South Central States:								
Kentucky	13	8	30	17	502	151	9	13
Tennessee	6	11	49	132	415	24	2	14
Alabama [3]	9	5	59	674	795	9	5	17
Mississippi [2]	6	2					1	1
West South Central States:								
Arkansas	8	1	130	129	411	4	0	0
Louisiana	12	16	12	68	25	164	4	0
Oklahoma [4]	7	4	95	162	111	26	1	1
Texas [3]	23	42	393	1,157	141	624	3	12
Mountain States:								
Montana	0	1		26	22	8	1	0
Idaho	1	1	16		8	18	1	3
Wyoming	2	0	1		28	3	0	1
Colorado [5]	7	5			544	4	0	0
New Mexico	2	4	19	8	110	129	0	3
Arizona	3	0	64	55	20	290	0	1
Utah [2] [6]	0	0			477	24	0	0
Pacific States:								
Washington	0	1	1		19	51	0	4
Oregon [6]	1	1	39	36	31	9	0	0
California	32	22	105	417	686	136	5	3
Total	453	414	1,478	4,770	40,085	11,041	77	189
First 13 weeks of year	7,754	6,774	34,820	255,661	414,587	81,722	1,161	2,208

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended Apr. 2, 1938	Week ended Apr. 3, 1937	Week ended Apr. 2, 1938	Week ended Apr. 3, 1937	Week ended Apr. 2, 1938	Week ended Apr. 3, 1937	Week ended Apr. 2, 1938	Week ended Apr. 3, 1937	Week ended Apr. 2, 1938
New England States:									
Maine	0	0	13	27	0	0	0	0	32
New Hampshire	0	0	10	10	0	0	0	0	7
Vermont	1	0	19	7	0	0	0	0	17
Massachusetts	0	0	386	287	0	0	0	0	97
Rhode Island	0	0	34	55	0	0	0	0	86
Connecticut	0	0	143	142	0	0	1	2	49
Middle Atlantic States:									
New York	1	1	907	941	0	0	4	8	393
New Jersey	0	1	133	272	0	0	3	3	229
Pennsylvania	2	0	461	1,134	0	0	5	5	231
East North Central States:									
Ohio	1	0	293	331	15	0	2	2	142
Indiana	0	0	159	241	62	3	2	1	30
Illinois	0	2	565	861	39	67	4	0	83
Michigan [2]	1	1	522	791	9	13	5	2	228
Wisconsin	0	0	176	304	12	2	0	1	180
West North Central States:									
Minnesota	0	0	147	158	23	4	3	1	29
Iowa	0	0	220	292	44	49	0	1	28
Missouri	1	0	182	275	26	62	4	0	43
North Dakota	1	0	31	20	5	6	0	1	35
South Dakota	0	0	11	76	14	2	0	0	18
Nebraska	0	0	37	87	0	8	0	0	12
Kansas	0	0	138	346	8	36	0	0	122

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Apr. 2, 1938, and Apr. 3, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended Apr. 2, 1938	Week ended Apr. 3, 1937	Week ended Apr. 2, 1938	Week ended Apr. 3, 1937	Week ended Apr. 2, 1938	Week ended Apr. 3, 1937	Week ended Apr. 2, 1938	Week ended Apr. 3, 1937	Week ended Apr. 2, 1938
South Atlantic States:									
Delaware	0	0	23	7	0	0	0	0	6
Maryland [3]	0	1	74	58	0	0	3	2	94
District of Columbia	0	0	18	8	0	0	0	0	14
Virginia	2	2	56	20	0	0	9	4	149
West Virginia	0	1	61	70	0	0	4	4	49
North Carolina [3]	2	0	33	30	0	0	2	8	564
South Carolina	0	0	1	5	0	0	3	2	80
Georgia [3]	0	1	13	9	0	0	1	3	35
Florida [3]	0	2	15	8	0	0	6	1	28
East South Central States:									
Kentucky	0	3	96	57	9	0	7	9	74
Tennessee	0	1	27	27	3	0	2	2	27
Alabama [3]	0	0	3	9	1	0	1	3	8
Mississippi [2]	9	1	7	10	2	0	4	0	-------
West South Central States:									
Arkansas	0	0	10	11	12	0	4	0	49
Louisiana	1	0	10	13	2	1	15	10	23
Oklahoma [4]	1	0	25	22	21	1	3	2	47
Texas [3]	0	3	118	138	29	2	18	13	414
Mountain States:									
Montana	0	0	16	27	7	14	1	0	22
Idaho	0	1	11	18	17	8	1	1	14
Wyoming	0	1	17	83	3	7	1	0	18
Colorado [5]	0	0	71	41	10	16	0	1	27
New Mexico	0	1	14	34	0	1	0	0	31
Arizona	0	1	5	5	8	0	1	0	37
Utah [2] [6]	0	0	47	19	0	0	0	0	47
Pacific States:									
Washington	1	0	44	34	16	10	2	5	153
Oregon [6]	0	2	62	36	17	12	1	1	17
California	0	3	213	203	44	9	6	5	477
Total	24	29	5,767	7,609	458	328	128	98	4,545
First 13 weeks of year	279	277	79,381	88,382	7,164	3,982	1,566	1,406	54,013

[1] New York City only.

[2] Period ended earlier than Saturday.

[3] Typhus fever, week ended Apr. 2, 1933, 15 cases, as follows: North Carolina, 1; Georgia, 7; Florida, 2; Alabama, 2; Texas, 3.

[4] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

[5] Colorado tick fever for week ended Apr. 2, 1938, Colorado, 1 case.

[6] Rocky Mountain spotted fever, week ended Apr. 2, 1938; 4 cases as follows: Utah, 1; Oregon, 3.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
February 1938										
Louisiana	9	42	90	16	17	14	0	48	1	66
Maryland	12	43	113	-------	190	1	1	279	0	5
Pennsylvania	22	198	-------	-------	27,752	-------	3	2,163	0	30
Puerto Rico	0	29	86	3,435	33	-------	0	-------	0	34
Rhode Island	3	2	-------	-------	12	-------	1	102	0	1
Texas	15	256	3,469	37	799	115	5	583	126	62
Virginia	17	74	2,106	4	2,028	13	0	156	4	6

Summary of monthly reports from States—Continued

February 1938

	Cases
Anthrax:	
Puerto Rico	1
Texas	1
Chickenpox:	
Louisiana	77
Maryland	761
Pennsylvania	5,300
Puerto Rico	36
Rhode Island	137
Texas	1,271
Virginia	400
Conjunctivitis:	
Rhode Island	1
Dengue:	
Texas	34
Diarrhea:	
Maryland	5
Dysentery:	
Louisiana (amoebic)	1
Maryland (bacillary)	1
Pennsylvania (amoebic)	1
Puerto Rico	17
Texas (amoebic)	3
Texas (bacillary)	36
Virginia (diarrhea included)	23
Encephalitis, epidemic or lethargic:	
Louisiana	1
Maryland	1
Pennsylvania	2
Rhode Island	1
Texas	4
Virginia	1
Filariasis:	
Puerto Rico	1
German measles:	
Maryland	21
Pennsylvania	234
Rhode Island	2
Hookworm disease:	
Louisiana	12
Impetigo contagiosa:	
Maryland	13
Jaundice:	
Maryland	14
Leprosy:	
Louisiana	1
Mumps:	
Louisiana	16
Maryland	128
Pennsylvania	4,623
Rhode Island	13
Texas	292
Virginia	347
Ophthalmia neonatorum:	
Louisiana	1
Maryland	1
Rhode Island	1
Virginia	1
Paratyphoid fever:	
Louisiana	3
Texas	6
Puerperal septicemia:	
Puerto Rico	1
Rabies in animals:	
Louisiana	19
Maryland	4
Rabies in man:	
Louisiana	2
Scabies:	
Maryland	2
Septic sore throat:	
Louisiana	16
Rhode Island	10
Virginia	36
Tetanus:	
Louisiana	3
Maryland	1
Puerto Rico	10
Tetanus, infantile:	
Puerto Rico	1
Trachoma:	
Louisiana	8
Trichinosis:	
Maryland	1
Tularaemia:	
Louisiana	2
Pennsylvania	1
Texas	6
Virginia	1
Typhus fever:	
Louisiana	1
Texas	22
Undulant fever:	
Louisiana	4
Maryland	5
Pennsylvania	6
Rhode Island	1
Virginia	1
Vincent's infection:	
Maryland	11
Whooping cough:	
Louisiana	53
Maryland	259
Pennsylvania	1,288
Puerto Rico	104
Rhode Island	175
Texas	921
Virginia	362

WEEKLY REPORTS FROM CITIES

City reports for week ended Mar. 26, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	192	461	110	7,007	913	2,663	27	408	22	1,404	--------
Current week [1]	131	159	47	16,360	709	2,045	49	363	34	1,266	--------
Maine:											
Portland	0	------	0	13	2	3	0	0	0	29	21
New Hampshire:											
Concord	0	------	0	0	0	0	0	0	0	0	7
Manchester	0	------	0	1	1	7	0	1	0	0	7
Nashua	0	------	0	0	0	1	0	0	0	0	9
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	1
Burlington	1	------	0	11	0	2	0	0	0	5	10
Rutland	0	------	0	0	0	0	0	0	0	0	3
Massachusetts:											
Boston	0	------	1	220	32	126	0	6	3	22	232
Fall River	0	------	0	1	2	1	0	1	0	5	30
Springfield	0	------	0	22	6	3	0	0	0	24	29
Worcester	0	------	0	3	9	31	0	2	0	0	52
Rhode Island:											
Pawtucket	0	------	0	0	0	4	0	0	0	0	28
Providence	0	------	0	1	6	18	0	2	1	13	59
Connecticut:											
Bridgeport	0	------	0	0	6	20	0	2	0	2	43
Hartford	0	1	0	3	6	29	0	1	0	2	44
New Haven	0	------	0	6	3	4	0	2	0	10	37
New York:											
Buffalo	0	------	0	7	20	63	0	8	0	5	164
New York	25	12	4	1,584	146	496	0	80	7	239	1,712
Rochester	0	1	0	7	1	22	0	2	0	8	66
Syracuse	1	------	0	37	4	3	0	1	0	13	57
New Jersey:											
Camden	1	2	2	28	3	10	0	0	0	4	27
Newark	0	2	1	39	12	25	0	3	0	42	107
Trenton	0	------	0	1	4	3	0	0	1	2	30
Pennsylvania:											
Philadelphia	9	4	3	796	32	157	0	16	1	37	507
Pittsburgh	4	2	4	276	21	42	0	10	0	17	157
Reading	0	------	1	13	1	1	0	0	0	3	19
Scranton	0	------	--------	65	-------	2	0	-------	0	9	--------
Ohio:											
Cincinnati	4	------	2	4	8	8	0	9	0	4	158
Cleveland	0	15	2	343	18	69	0	11	0	38	190
Columbus	2	1	1	265	6	6	16	3	0	1	84
Toledo	2	1	0	125	5	10	0	3	0	19	83
Indiana:											
Anderson	0	------	0	82	0	2	3	0	0	2	12
Fort Wayne	0	------	0	136	4	8	0	0	0	1	30
Indianapolis	11	------	2	248	9	17	1	2	0	9	89
Muncie	0	------	0	0	0	0	0	0	0	0	9
South Bend	0	------	0	48	2	1	5	0	0	0	14
Terre Haute	2	------	--------	25	-------	1	0	-------	0	0	--------
Illinois:											
Alton	0	------	0	0	0	4	0	0	0	0	4
Chicago	13	------	1	3,103	48	253	2	40	2	38	760
Elgin	2	------	0	3	4	4	0	0	0	5	15
Moline	0	------	0	41	1	5	0	0	0	1	6
Springfield	0	------	0	267	2	4	0	0	0	4	24
Michigan:											
Detroit	4	------	1	3,027	17	132	0	11	0	93	239
Flint	0	------	0	45	1	45	0	0	0	34	32
Grand Rapids	0	------	0	127	4	19	0	0	0	2	35
Wisconsin:											
Kenosha	0	------	0	24	0	5	0	0	0	1	8
Milwaukee	2	2	2	3,063	3	19	0	3	1	39	138
Racine	0	------	0	150	0	10	0	0	0	17	12
Superior	0	------	0	9	1	6	1	0	0	2	9

[1] Figures for Wheeling (cases) estimated; report not received.

City reports for week ended Mar. 26, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	0	0	1	2	0	0	0	17	29
Minneapolis	0	------	1	68	11	25	2	0	0	3	113
St. Paul	0	------	0	9	7	7	3	4	0	2	60
Iowa:											
Cedar Rapids	0	------	------	3	------	6	0	------	0	3	------
Davenport	1	------	------	0	------	3	0	------	0	0	------
Des Moines	0	------	0	4	0	32	0	0	0	0	36
Sioux City	0	------	------	0	------	8	0	------	0	0	------
Waterloo	2	------	------	119	------	5	0	------	0	0	------
Missouri:											
Kansas City	1	------	0	175	15	7	0	2	0	1	91
St. Joseph	0	------	0	97	1	2	0	0	0	0	26
St. Louis	7	------	1	10	15	88	1	3	2	3	208
North Dakota:											
Fargo	0	------	0	0	0	2	0	0	0	1	3
Grand Forks	0	------	------	5	------	0	0	------	0	0	------
South Dakota:											
Aberdeen	0	------	------	1	------	0	0	------	0	6	------
Nebraska:											
Lincoln	1	------	------	3	------	7	0	------	0	0	------
Omaha	0	------	0	19	14	1	0	5	0	1	61
Kansas:											
Lawrence	0	------	1	0	1	0	0	0	0	2	4
Topeka	0	------	0	88	2	2	0	0	0	32	13
Wichita	0	------	0	9	5	4	0	1	0	7	33
Delaware:											
Wilmington	0	------	0	18	6	3	0	0	0	4	42
Maryland:											
Baltimore	2	7	0	12	27	43	0	15	0	37	234
Cumberland	0	------	0	7	1	0	0	0	0	0	8
Frederick	0	------	0	5	0	0	0	0	0	0	1
Dist. of Col.:											
Washington	6	1	0	18	12	28	0	9	0	6	177
Virginia:											
Lynchburg	0	------	0	0	3	0	0	1	0	1	17
Norfolk	0	------	0	133	3	13	0	1	0	9	24
Richmond	0	------	0	61	4	4	0	4	0	2	58
Roanoke	0	------	0	0	1	1	0	0	0	7	18
West Virginia:											
Charleston	0	1	0	18	1	1	0	0	0	0	12
Huntington	0	------	------	5	------	1	0	------	0	0	------
Wheeling	------	------	0	------	2	------	------	1	------	------	22
North Carolina:											
Gastonia	0	------	------	23	------	0	0	------	0	14	------
Raleigh	0	------	0	71	2	0	0	0	0	30	14
Wilmington	0	------	0	248	2	0	0	0	0	17	7
Winston-Salem	0	------	0	3	2	0	0	2	1	46	17
South Carolina:											
Charleston	0	38	0	20	3	2	0	1	0	2	20
Florence	0	------	0	9	1	0	0	0	0	0	15
Greenville	0	------	0	1	4	0	0	0	0	10	21
Georgia:											
Atlanta	2	12	1	72	11	4	2	5	0	9	91
Brunswick	1	------	0	6	0	0	0	0	0	0	4
Savannah	0	6	0	75	2	0	0	2	0	2	39
Florida:											
Miami	0	------	0	78	3	2	0	1	0	0	31
Tampa	4	1	1	6	0	0	0	1	0	0	26
Kentucky:											
Ashland	0	------	------	1	------	0	0	------	0	8	------
Covington	0	------	0	1	1	0	0	0	0	0	13
Lexington	0	------	0	0	1	1	0	0	0	2	19
Louisville	9	2	1	265	5	39	0	2	0	14	83
Tennessee:											
Knoxville	0	1	0	55	2	1	0	2	0	8	30
Memphis	2	------	1	37	11	3	0	8	0	3	81
Nashville	0	------	1	145	6	5	0	2	0	13	47
Alabama:											
Birmingham	1	11	2	193	8	4	0	5	2	0	74
Mobile	0	2	3	31	2	1	0	0	0	0	27
Montgomery	0	------	------	80	------	0	0	------	0	1	------
Arkansas:											
Fort Smith	0	------	------	5	------	1	0	------	0	0	------
Little Rock	0	------	0	66	3	0	0	2	0	2	6

City reports for week ended Mar. 26, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	1	2	3
New Orleans	4	15	0	1	10	6	0	15	9	22	154
Shreveport	0	------	0	6	5	4	0	2	1	0	36
Oklahoma:											
Muskogee	0	------	--------	0	-------	0	0	-------	0	2	--------
Oklahoma City	0	------	0	0	5	5	0	1	0	0	38
Tulsa	0	------	--------	28	-------	3	4	-------	0	8	--------
Texas:											
Dallas	2	1	1	6	6	17	0	3	0	2	60
Fort Worth	1	------	0	0	8	6	2	1	0	12	50
Galveston	0	------	0	0	1	0	0	1	0	0	16
Houston	1	1	1	0	11	1	0	8	1	0	83
San Antonio	0	------	2	0	5	0	0	3	0	0	66
Montana:											
Billings	0	------	0	0	0	2	0	0	0	0	6
Great Falls	0	------	0	0	0	0	2	0	0	5	6
Helena	0	------	0	0	0	0	0	0	0	2	1
Missoula	0	1	1	0	2	0	0	0	0	0	8
Idaho:											
Boise	0	------	0	0	3	2	4	0	0	0	12
Colorado:											
Colorado Springs	0	------	0	0	2	4	0	1	0	0	14
Denver	2	------	0	397	9	18	0	4	0	1	86
Pueblo	0	------	1	1	3	2	0	1	0	10	16
Utah:											
Salt Lake City	2	------	0	173	4	11	0	1	1	4	28
Washington:											
Seattle	0	------	0	1	6	4	0	5	0	47	100
Spokane	0	1	1	1	0	3	1	2	0	13	31
Tacoma	0	------	0	0	1	13	0	1	0	6	39
Oregon:											
Portland	1	2	0	10	11	9	8	1	0	2	92
Salem	0	2	--------	1	-------	0	0	-------	0	0	--------
California:											
Los Angeles	15	16	1	29	19	46	9	15	1	20	328
Sacramento	0	1	1	8	1	1	0	3	0	53	31
San Francisco	1	2	0	0	4	12	0	11	0	62	157

State and city	Meningocccus meningitis		Poliomyelitis cases	State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				Missouri:			
Boston	4	0	0	Kansas City	1	0	0
Rhode Island:				Nebraska:			
Providence	1	0	0	Omaha	1	0	0
New York:				Maryland:			
Buffalo	3	0	0	Baltimore	1	1	0
New York	3	3	1	District of Columbia:			
Rochester	0	0	1	Washington	1	0	0
Syracuse	1	0	0	North Carolina:			
Pennsylvania:				Raleigh	0	1	0
Philadelphia	0	1	0	Florida:			
Pittsburgh	1	1	0	Miami	1	1	0
Ohio:				Kentucky:			
Cincinnati	2	0	0	Louisville	1	0	0
Columbus	1	1	1	Alabama:			
Indiana:				Birmingham	2	0	0
Anderson	1	0	0	Arkansas:			
Illinois:				Little Rock	0	1	0
Chicago	1	0	0	Louisiana:			
Michigan:				New Orleans	1	0	0
Detroit	0	0	1	Shreveport	0	1	0
Minnesota:				Texas:			
Minneapolis	0	0	1	Dallas	1	1	0

Encephalitis, epidemic or lethargic.—Cases: New York, 1; Newark, 1; St. Louis, 1; New Orleans, 1; San Francisco, 2; Washington, D. C., 1.

Pellagra.—Cases: Atlanta, 2; Memphis, 1; Birmingham, 3; Dallas, 1; Los Angeles, 3.

Typhus fever.—Cases: Savannah, 1.

FOREIGN AND INSULAR

FINLAND

Communicable diseases—February 1938.—During the month of February 1938, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	250	Scarlet fever	758
Influenza	3,541	Typhoid fever	11
Paratyphoid fever	22	Undulant fever	2
Poliomyelitis	3		

IRISH FREE STATE

Vital statistics—Fourth quarter ended December 31, 1937.—The following vital statistics for the Irish Free State for the quarter ended December 31, 1937, are taken from the Quarterly Return of Marriages, Births, and Deaths, issued by the Registrar General, and are provisional:

	Number	Rate per 1,000 population		Number	Rate per 1,000 population
Marriages	3,620	4.9	Deaths from—Continued.		
Births	12,868	17.5	Influenza	126	0.17
Total deaths	9,920	13.5	Measles	20	--------
Deaths under 1 year of age	889	[1] 69	Puerperal sepsis	8	[1] .62
Deaths from:			Scarlet fever	27	--------
Cancer	910	1.24	Tuberculosis (all forms)	733	1.00
Diarrhea and enteritis (under 2 years)	143	--------	Typhoid fever	21	--------
Diphtheria	79	--------	Whooping cough	35	--------

[1] Per 1,000 births.

Vital statistics—Year 1937.—The following vital statistics for the Irish Free State for the year 1937 are taken from the Quarterly Return of Marriages, Births, and Deaths, issued by the Registrar General, and are provisional:

	Number	Rate per 1,000 population		Number	Rate per 1,000 population
Marriages	14,896	5.1	Deaths from—Continued.		
Births	56,564	19.2	Influenza	2,698	0.92
Total deaths	45,115	15.3	Measles	120	----------
Deaths under 1 year of age	4,057	[1] 72	Puerperal sepsis	44	[1] .78
Deaths from:			Scarlet fever	127	----------
Cancer	3,558	1.21	Tuberculosis (all forms)	3,582	1.22
Diarrhea and enteritis (under 2 years)	601	----------	Typhoid fever	65	----------
Diphtheria	289	----------	Typhus fever	4	----------
			Whooping cough	276	----------

[1] Per 1,000 births.

ITALY

Communicable diseases—4 weeks ended January 30, 1938.—During the 4 weeks ended January 30, 1938, cases of certain notifiable diseases were reported in Italy as follows:

Disease	Jan. 3-9	Jan. 10-16	Jan. 17-23	Jan. 24-30
Anthrax	14	19	15	11
Cerebrospinal meningitis	17	26	19	35
Chickenpox	278	315	368	373
Diphtheria	604	618	630	665
Dysentery	16	25	30	31
Hookworm disease	3	9	4	8
Lethargic encephalitis	1	3	6	1
Measles	1,572	1,739	1,731	2,320
Mumps	109	216	257	203
Paratyphoid fever	40	60	47	38
Pellagra	4	4	1	3
Poliomyelitis	13	17	17	11
Puerperal fever	48	55	59	47
Scarlet fever	189	219	294	248
Typhoid fever	292	325	340	285
Undulant fever	36	45	60	86
Whooping cough	215	281	376	401

SWEDEN

Notifiable diseases—February 1938.—During the month of February 1938, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	5	Poliomyelitis	[1] 51
Diphtheria	3	Scarlet fever	1,704
Dysentery	23	Syphilis	22
Epidemic encephalitis	1	Typhoid fever	4
Gonorrhea	886	Undulant fever	18
Paratyphoid fever	9	Weil's disease	2

[1] Includes 6 cases nonparalytic at time of notification.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for March 25, 1938, pages 470–483. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

Indochina (French).—During the week ended March 26, 1938, cholera was reported in French Indochina as follows: Annam Province, 6 cases; Tonkin Province, 17 cases; Hanoi, 7 cases.

Plague

Niger Territory (French)—North Tanout.—During the period March 10–20, 1938, 26 cases of plague with 16 deaths were reported in North Tanout, French Niger Territory.

Union of South Africa—Cape Province—Port Elizabeth.—During the week ended April 2, 1938, three deaths from plague were reported in Port Elizabeth, Cape Province, Union of South Africa.

Yellow Fever

Brazil.—Deaths from yellow fever have been reported in Brazil as follows: Minas Geraes State—Alvinopolis, February 20–25, 3; Barbacena, March 6, 1 (first appearance); Entre Rios, February 17–25, 4; Guiricema, March 2, 1 (first appearance); Gymirim, March 5, 1; Juiz de Fora, March 3–8, 3; Lagoa Dourada, February 27, 1 (first appearance); Machado, February 14, 1; Monlevade, March 4, 1 (first appearance); Rezende Costa, March 1, 1; Rio Preto, March 1–3, 2; Rio de Janeiro State—Duas Barras, March 10, 1 (first appearance); Teresopolis, March 8, 1 (first appearance).

UNITED STATES TREASURY DEPARTMENT

PUBLIC HEALTH REPORTS

ISSUED WEEKLY

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IN THIS ISSUE

Frequency of Surgical Operations in 40,000 Persons
Summary of Maternal Mortality, by States, 1926-1936

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UNITED STATES PUBLIC HEALTH SERVICE

Thomas Parran, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg Gen. Robert Olesen, *Chief of Division*

The Public Health Reports, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PUBLIC HEALTH REPORTS

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FREQUENCY OF SURGICAL PROCEDURES AMONG 9,000 FAMILIES, BASED ON NATION-WIDE PERIODIC CANVASSES, 1928–31 [1]

By SELWYN D. COLLINS, *Principal Statistician, United States Public Health Service*

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Surgical treatment of wounds and fractures and of external parts of the body was practiced even in ancient times (*17*). In the Middle Ages many minor operations were performed by barbers and some major operations were done by surgeons (*16*, p. 118). However, infection following the operation was the rule rather than the exception. The extensive use of surgery involving the internal organs came only after two other developments; namely, the successful use of anesthetics and particularly the development of aseptic procedures (*15*, p. 13). Joseph Lister, the great English surgeon, first used antiseptic methods in 1865 (*13*, p. 71); modern aseptic surgical procedures, however, are vastly different from Lister's epoch-making beginnings.[2]

Even with these improvements, surgery was slow to spread beyond the caring for lacerations, wounds, and fractures where any sort of surgical procedure was better than none. Maes (*14*) states that 60 years ago practically all operations were of an emergency nature, undertaken with little hope of success and only because death was inevitable under any circumstances.

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[1] From Statistical Investigations, Division of Public Health Methods, National Institute of Health.

This is the eleventh of a series of papers on sickness and medical care in this group of families (*1–10*). The survey of these families was organized and conducted by the Committee on the Costs of Medical Care; the tabulation was done under a cooperative arrangement between the Committee and the Public Health Service. Committee publications based on the results deal primarily with costs and Public Health Service publications primarily with the incidence of illness and the extent and kind of medical care, without regard to cost. As costs are meaningless without some knowledge of the extent and nature of the service received, there is inevitably some overlapping. The committee staff, particularly Dr. I. S. Falk and Miss Margaret Klem, cooperated in the tabulation of the data.

Special thanks are due to Dr Mary Gover, who assisted in the analysis, to Mrs Lily Vanzee Welch, who was in immediate charge of tabulating the data, and to other members of the statistical staff of the Public Health Service for advice and assistance in the preparation of the study.

[2] It has been said that Semmelweis' theory of contact infection formulated in 1847 is the basis of present day aseptic technique. Lister's work, however, was the first application of antiseptic methods to surgery. See Weekly Bulletin of the New York City Department of Health, vol. 18, p. 66, March 2, 1929.

According to Matas (*15*, p. 13), Charity Hospital in New Orleans in 1881 had 172 surgical operations among 5,309 admissions, or 3.2 percent of the total cases. Two-thirds of the 172 operations were of an emergency character, 72 being amputations, 23 incisions for abscess, and 18 extractions of bullets. Only one was an abdominal operation. This showing may be contrasted with the record for the same hospital in 1923 when there were 16,405 operations among the 20,565 admissions, or 79.8 percent of the total cases.

The number of physicians specializing in surgery and the number of major as well as minor operations have increased greatly in the present century. United States Army and Navy records indicate that there are now about twice as many operations per 1,000 men in those organizations as in 1910; that there are nearly three times as many appendectomies; and that there are approximately 10 times as many tonsillectomies per 1,000 men as in 1910.[3]

Questions are frequently asked about the annual number of surgical operations of all or of specific kinds in the United States. Such queries have not been answered even by estimates, because it is impracticable to secure from all doctors and hospitals in any sample area records of the number of operations performed; when individual physicians or hospitals attempt to answer the question from their own records, they have no population to which the operations can be related for the computation of rates. If data were collected on surgical operations from all hospitals in a given city or State, they would include

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[3] Surgical operation rates in the U. S. Army and the U. S. Navy in 2 periods were as follows:

Years	Annual operation rate per 1,000					Number of operations					Population (person-years of life observed)
	All operations	Tonsillectomy	Appendectomy	Hemorrhoid operations	Hernia operations	All operations	Tonsillectomy	Appendectomy	Hemorrhoid operations	Hernia operations	
						U. S. Navy					
1908–12	66.9	2.0	5.1	3.2	5.1	19,510	573	1,483	947	1,481	291,721
1933–35	109.5	27.9	13.7	4.3	4.8	36,313	9,254	4,550	1,418	1,604	331,754
						U. S. Army					
1908–12	50.6	3.1	3.1	3.4	2.5	20,834	1,260	1,273	1,389	1,039	411,500
1933–35	121.6	21.7	10.1	no data	3.9	50,330	8,995	4,166	no data	1,024	413,775

The number of operations in the Navy in 1909 was increased 42 percent by 1,638 operations on boils that occurred as an "epidemic" on the battleship *Pennsylvania*; if these are deducted from the total the average annual rate for all operations for the period 1908–12 is 61.3 per 1,000 instead of 66.9.

Tonsillectomy includes operations in which both the tonsils and adenoids were removed but does not include adenoidectomy alone.

Operations by Army and Navy doctors on nonservice personnel are excluded in the period 1933–35 for both services; no data are available to exclude such operations in the earlier period.

only three-fifths of the total, for nearly two-fifths of the operations are done outside of hospitals, according to figures to be presented later. The Army and Navy medical departments are about the only organizations with populations under observation to which they give practically all medical care; thus operation rates can be computed for these groups, but they are selected classes with respect to age, sex, state of health, and availability of surgical service. The rates, therefore, give little indication of the number of operations that occur in the general population.

I. SOURCE AND CHARACTER OF DATA

In the study of illness in canvassed white families in 130 localities in 18 States [4] that was made by the Committee on the Costs of Medical Care (*12*) and the United States Public Health Service, all service received from physicians and other practitioners was recorded, including the nature of surgical procedures used. This record of all surgical operations for persons in the observed population affords data on the frequency of these procedures during the 12 months covered by periodic canvasses.

The composition and characteristics of the group of 8,758 families which were kept under observation for 12 consecutive months in the years 1928–31 have been considered in some detail in the first report in the series (*1*). These families, including a total of 39,185 individuals, resided in 18 States representing all geographic sections. Every size of community was included, from metropolitan districts to small industrial and agricultural towns and rural unincorporated areas.[5] With respect to income, the distribution was reasonably similar to the estimated distribution of the general population of the United States at the time of the survey.

Definition of illness and of surgical procedure.—An illness, for the purpose of this study, was defined as any symptom, disorder, or affection which persisted for one or more days or for which medical service [6] was received or medicine purchased. In general, the illness record covers the ailments which the family informant remembered and designated as illness.

Provision was made for recording all surgical procedures that were done during the study year in connection with any illness. Since nurses made the periodic canvasses, it may be assumed that a more complete record of operations was obtained than would have been secured by visitors with no knowledge of surgical procedures. The entry as made by the nurse was accepted without correction, except to consider as surgical any case in which the diagnosis itself indicated that surgical treatment had been given but not recorded as such on the schedule. Examples of these diagnoses are boil lanced, abscess drained, and fracture of the leg or other part of the body which would involve the setting of a bone or placing of a cast. The definition of a surgical procedure was necessarily inexact, but in general it was the common conception of any treatment which involves the cutting of tissue or suturing of wounds, plus the setting of a bone or placing of a cast. While these latter procedures are seldom included in the definition of an operation, they are surgical in nature. Accidental injuries and childbirth were not considered surgical unless some specific surgical procedure was reported on the case; the use of forceps was not considered a surgical procedure. Operations and surgical cases as used in this study refer always to cases which actually had surgical treatment and do not include those cases sometimes designated as surgical merely because of the nonmedical nature of the case.

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[4] The 18 States sampled and the number of canvassed families were as follows: California (890), Colorado (386), Connecticut (100), District of Columbia (99), Georgia (544), Illinois (463), Indiana (494), Kansas (301), Massachusetts (287), Michigan (329), Minnesota (224), New York (1,710), Ohio (1,148), Tennessee (212), Virginia (412), Washington (551), West Virginia (318), Wisconsin (290). Further details about the distribution of the canvassed population are included in a preceding paper (*1*).

[5] Every community that was included in the study had either a local health department or some other organization employing a visiting nurse or both; possibly the rural communities of this kind may have had more surgical operations than those with no such organizations

[6] Exclusive of dental service, eye refractions, immunizations and health examinations rendered when no symptoms were present.

II. FREQUENCY OF SURGICAL PROCEDURES IN THE WHOLE GROUP OBSERVED

The frequency of surgical operations in a given population group may be expressed in at least two ways:

1. The annual number of surgical operations per 1,000 persons under observation.
2. The percentage of all cases of illness that were treated surgically.

The first measure, which considers the frequency of surgical treatment without regard to the number of illnesses or the need for surgery, is the subject of this paper; the second will be treated in another article in this series.

For the total of 38,544 person-years of observation there were 2,623 surgical operations,[7] an annual rate (adjusted for age) of 65.0 operations per 1,000 persons. This includes surgical treatment in connection with both primary and contributory causes of illness and in a few instances two or more operations in connection with the same diagnosis. The annual rate for sole or primary diagnoses that had surgical treatment in connection with them was 60 per 1,000 (age corrected). Of the total of 34,287 diagnoses (sole, primary, and contributory)[8] 7.6 percent were treated surgically.

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[7] Hospitals sometimes divide all cases into "medical" and "surgical," including in the latter all accident cases, whether or not there was any actual operation in connection with the case. If this procedure were used in this study, it would greatly increase the number of surgical cases; there were 1,903 accidents (exclusive of poisonings) that were attended by a doctor but not classified as surgical, which would add 73 percent to the total of 2,623 operations as defined in this study.

Some doctors also consider all births, miscarriages, and abortions as surgical in nature. There were 852 such cases attended by a doctor but not classified as surgical, which would add 32 percent to the total of 2,623 operations as defined in this study.

These two changes in the definition of surgical treatment would more than double the number of operations; however, neither change seems justified. The doctor's service on many of the accident cases classified as non-surgical may have been only an examination to determine whether injury had occurred. Likewise the consensus of medical opinion probably would not consider all maternity cases as surgical in nature. When such cases are designated as surgical it is usually because they do not fit into the medical class.

Age and sex.—Table 1 and figure 1 show the age and sex incidence of all surgical operations. The adjusted rates are 62 and 68 per 1,000 for males and females, respectively. Since a considerable amount of surgery is done in connection with diseases and conditions not common to the two sexes, rates are shown also for all operations except those in connection with male and female genital and puerperal diagnoses. For all operations except those diagnoses the rates are nearly the same for the two sexes, 58 and 56 per 1,000 for males and females, respectively.

The age incidence of surgical operations shows two distinct peaks, one at 5–9 and one at 30–34 years. The earlier peak is largely accounted for by tonsillectomy and the latter by female genital and

TABLE 1.—*Frequency of all surgical operations among males and females of specific ages—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Age	Annual operation rate per 1,000 population						Number of operations				Population (years of life)[2]		
	All operations			All except male and female genital [1] and puerperal			All operations		All except male and female genital [1] and puerperal				
	Both sexes	Male	Female	Both sexes	Male	Female	Male	Female	Male	Female	Both sexes	Male	Female
All ages: [3]													
Adjusted [4]	65.0	61.8	67.6	56.9	57.6	56.2	1,263	1,360	1,159	1,141	38,544	18,896	19,627
Crude	68.1	66.8	69.3	59.7	61.3	58.1							
Under 5	72.2	88.3	55.9	57.9	60.9	55.1	248	150	171	148	5,513	2,808	2,684
5–9	93.1	105.7	80.8	91.2	101.8	80.8	298	234	287	234	5,715	2,820	2,895
10–14	65.0	70.0	60.0	64.1	68.2	60.0	161	136	157	136	4,568	2,301	2,267
15–19	52.1	51.7	52.5	51.1	51.1	51.2	79	80	78	78	3,050	1,527	1,523
20–24	66.1	55.9	73.5	55.2	55.9	54.7	50	90	50	67	2,119	894	1,225
25–29	71.9	56.8	82.0	53.4	55.8	51.8	57	122	56	77	2,491	1,004	1,487
30–34	78.1	58.7	93.7	60.3	58.7	61.7	82	164	82	108	3,149	1,398	1,751
35–44	63.1	50.3	75.9	50.9	50.3	51.5	150	224	150	152	5,930	2,979	2,951
45–54	46.3	40.1	53.8	42.1	39.0	45.8	74	81	72	69	3,351	1,845	1,506
55–64	48.2	48.5	47.8	45.5	47.3	43.3	39	32	38	29	1,473	804	669
65 and over	61.1	52.6	67.7	52.1	36.6	64.2	23	38	16	36	998	437	561

[1] "Female genital" includes female breast in this table and all other tables.

[2] 1 "year of life" is the equivalent of 12 months of observation for 1 person; for example, 2 persons observed for 6 months each are counted as 1 year of life. "Years of life" in these columns are the base populations used for computing annual rates in this study.

[3] "All ages" includes a few of unknown age; "both sexes" includes a few of unknown sex.

[4] Rates for all ages are adjusted by the *direct* method to the age distribution of the white population of the registration States in 1930, as a standard population; this population is given for specific ages in table 1 of a preceding paper (*4*). The adjustment method involves the weighting of the age specific rates for the canvassed population according to the age distribution of the standard population. The details of the process are given under the heading of "corrected death-rates" in Pearl (*18*, pp. 269-271).

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[8] Throughout this paper the frequency of surgical treatment is measured by the total number of operations regardless of whether the diagnosis on which they were done was sole, primary, or contributory. The tables of duration and other items that measure severity, however, are based on sole diagnoses only.

puerperal diagnoses; the adult peak in the curve for males is very small. When female genital and puerperal operations are eliminated from the comparison, the frequency of operations is almost identical for corresponding adult ages of the two sexes.

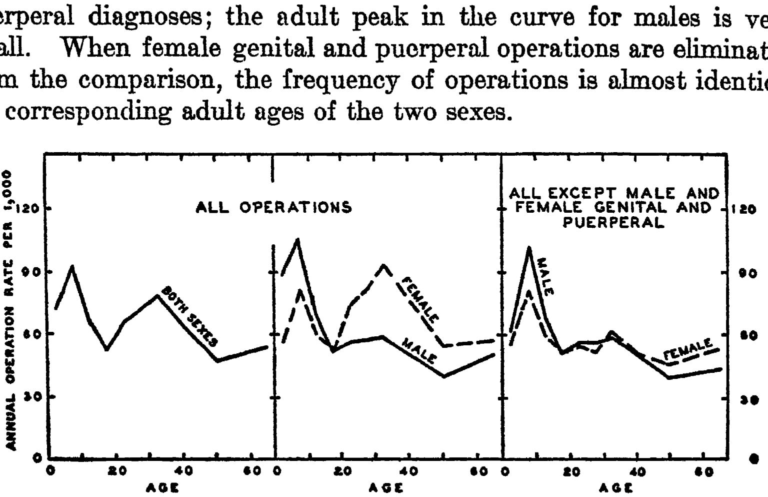

FIGURE 1.—Frequency of all surgical operations among males and females of specific ages—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31.

Surgical procedures include everything from a major abdominal operation to lancing a boil or removing a wart. It is necessary to

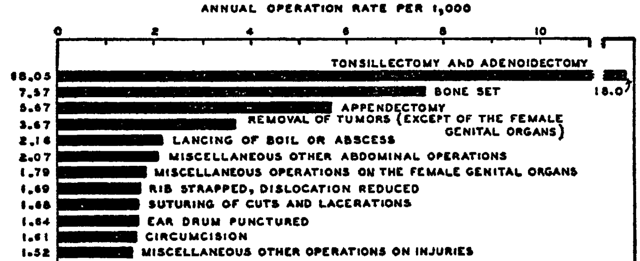

FIGURE 2.—Frequency of certain surgical operations among 8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31. (Rates adjusted to the age distribution of the white population of the registration States in 1930.)

consider the various kinds of operations before the age curves in figure 1 have much meaning. Rates (adjusted for age) for different kinds of operations are shown in table 2 and figure 2. Tonsillectomy is by far the most frequent operation, constituting nearly one-third of the total number reported. The next three most frequent operations are the setting of a bone, removal of the appendix, and the removal of benign tumors.

TABLE 2.—*Frequency of certain surgical operations at specific ages—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Nature of operation	All ages [1]			Age								
	Number of operations	Adjusted [2]	Crude	Under 5	5–9	10–14	15–19	20 24	25–34	35–44	15–54	55 and over
		Annual operation rate per 1,000 persons of both sexes										
All operations	2,623	64.97	68.05	72.19	93.09	65.02	52.13	66.07	75.35	63.07	46.25	53.42
Tonsillectomy and adenoidectomy	845	18.05	21.92	27.03	55.12	31.09	15.41	14.16	13.12	9.95	5.97	2.43
Sinus and nose operations	50	1.41	1.30	.18	.70	.44	.98	.47	2.84	2.19	1.79	1.62
Eardrum punctured	84	1.64	2.18	6.35	4.72	1.75	1.31	1 42	.53	.67	------	------
Mastoidectomy	39	.82	1.01	2.36	2.45	.44	.98	.47	.35	.34	.30	.40
Cervical or other lymphatic gland operations	26	.49	.67	2.54	.70	.88	.33	------	.35	.17	------	------
Thyroid operations	19	.56	.49	------	------	------	.33	.47	1.42	.84	.90	.40
Appendectomy	202	5.67	5.24	.54	2.45	6 79	9.84	11 80	9.57	5.40	.90	3.64
Hernia operations	43	1.31	1.12	.54	.70	.44	.98	1.42	1.60	.67	2.69	2.43
Gall bladder operations	31	1.09	.80	------	------	------	------	1.42	.89	1.18	2.39	3.24
Miscellaneous other abdominal operations	66	2.07	1.71	.54	.17	.22	.33	2.83	2.30	3.71	2.09	4.86
Hemorrhoid operations	20	.57	.52	------	------	------	------	.47	.71	1.52	1.49	.40
Operations on bones, joints, and other organs of locomotion	40	.97	1.04	1.27	.70	1.75	1.31	1.42	.89	1.18	.60	------
Lancing of boil or abscess	83	2.16	2.15	2.54	1.22	1.31	3.93	.94	3.55	2.19	1.19	1.62
Cancer operations	21	.85	.54	------	------	------	------	------	.18	1.01	.90	4.45
Removal of tumors (except of the female genital organs)	125	3.67	3.24	1.27	1.75	1.09	2.95	2.36	3.55	5.40	7.16	5.26
Removal of tumors of the female genital organs	48	1.39	1.25	------	------	------	------	2.83	3.55	2.70	.90	1.22
Hysterectomy	31	.80	.80	------	------	------	------	------	1.77	2.70	.90	.40
Dilatation and curettage	38	1.05	.99	------	------	------	.33	3.30	2.66	2.53	------	------
Repair of childbirth injuries	36	.97	.93	------	------	------	------	1.42	4.08	1.01	.60	.40
Miscellaneous other operations on the female genital organs	66	1.79	1.71	.36	------	------	.33	3.30	5.85	3.20	1.19	------
Circumcision	94	1.61	2.44	13.97	1.92	.88	------	------	.18	------	.30	------
Bone set	296	7.57	7.68	6.53	12.07	11.38	6.56	5.66	4.61	6.41	4.77	10.93
Rib strapped, dislocation reduced	50	1.60	1.30	------	.35	.66	1.64	2.36	1.42	1.35	2.39	4.45
Suturing of cuts and lacerations	70	1.68	1.82	2.18	3.67	.66	.98	3.30	1.60	1.35	1.49	.81
Operations on infected wounds	49	1.29	1.27	.36	.70	1.75	1.31	.47	2.48	1.35	2.09	.40
Miscellaneous other operations on injuries	67	1.52	1.74	2.18	1.40	2.41	.98	.94	2.48	2.02	.60	.40
Miscellaneous other operations	84	2.28	2.19	1.45	2.30	1.08	1.32	2.84	2.82	2 03	2.65	3.60
		Annual operation rate per 1,000 females										
Removal of tumors of the female genital organs	48	2.64	2.45	------	------	------	------	4.90	6.18	5.42	1.99	2.44
Hysterectomy	31	1.56	1.58	------	------	------	------	------	3.09	5.42	1.99	.81
Dilatation and curettage	38	1.95	1.94	------	------	------	0.66	5.71	4.63	5.08	------	------
Repair of childbirth injuries	36	1.82	1.83	------	------	------	------	2.45	7.10	2.03	1.33	.81
Miscellaneous other operations on the female genital organs	66	3.35	3.36	0.75	------	------	.66	5.71	10.19	6.44	2.66	------

[1] "All ages" includes a few of unknown age; "both sexes" includes a few of unknown sex.
[2] Adjusted by the *direct* method as described in note to table 1.

TABLE 2.—*Frequency of certain surgical operations at specific ages—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*—Continued

Nature of operation	All ages			Age								
	Number of operations	Adjusted	Crude	Under 5	5–9	10–14	15–19	20–24	25–34	35–44	45–54	55 and over
	Annual operation rate per 1,000 males											
Circumcision	94	3.17	4.97	27.42	3.90	1.74	------	------	0.42	------	0.54	------
	Population (years of life)											
Both sexes	38,544	------	------	5,513	5,715	4,568	3,050	2,119	5,640	5,930	3,351	2,471
Female	19,627	------	------	2,684	2,895	2,267	1,523	1,225	3,238	2,951	1,506	1,230
Male	18,896	------	------	2,808	2,820	2,301	1,527	894	2,402	2,979	1,845	1,241

If operations in connection with injuries are considered as a unit, they amount to 20.3 percent of the total, and the group of female genital and puerperal operations equals 8.3 percent of the total. When these two groups are added to tonsillectomy (32.2 percent) and appendectomy (7.7 percent), the four fairly specific types of operations make up about two-thirds of all operations.

Figure 2 presents a total of 26 fairly specific kinds of operations which include all that occurred with sufficient frequency in this study to be of statistical value.

Figures 3 and 4 show the age incidence of 24 of the 26 groups of operations. The vertical, or rate, scales for these charts are made in such a way that the relative age curves are comparable from one operation to another, whether the actual rate is small or large. In considering age incidence, however, one must discount minor fluctuations in the curves and think only of their general outlines. This is necessary because of the attempt to show here the incidence of every possible operation with sufficient numbers to give a general picture of the age curve.

The age incidence of the operations shown graphically in figures 3 and 4 need not be described in detail, but a few points may be mentioned briefly. Tonsillectomy pertains chiefly to the late preschool and early school ages, the peak being at 6 years (table 3). Other operations that are relatively frequent in the school ages are the setting of bones in fracture cases; the suturing of cuts; and operations for diseases of the bones, joints, and organs of locomotion. Puncturing the ear drum, mastoidectomy, and operations on the cervical and other lymphatic glands are high in the preschool ages, with markedly declining rates as age increases. Appendectomy, sinus operations, surgical treatment of infected wounds, and lancing of boils have their peaks in the young adult ages, 20 to 35 years. The operations with somewhat later peaks and distinct declines in the older ages are those for hemorrhoids and for thyroid and the various operations in connection with female genital and puerperal diagnoses. The operations that are more frequent in the older ages are those for gall bladder, hernia, cancer, tumor, dislocations, and fractures.

In many instances surgical cases represent a rather small proportion of the total cases, but the age curves are generally similar to those for all cases of corresponding diagnoses. This matter will be considered in more detail in a later paper.

TABLE 3.—*Frequency of certain surgical operations among children classified by single years of age—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Age	Annual operation rate per 1,000 population			Number of operations			Population (years of life)	
	Tonsillectomy and adenoidectomy	Ear and mastoid operations	Circumcisions per 1,000 males	Tonsillectomy and adenoidectomy	Ear and mastoid operations	Circumcisions (males)	Both sexes	Males
All under 15:								
Adjusted [1]	38.2	6.0	10.6	606	99	92	15,796	7,929
Crude	38.4	6.3	11.6					
Under 1	2.0	8.1	116.4	2	8	[2] 56	990	481
1	12.7	10.3	12.3	16	13	8	1,261	652
2	23.0	9.6	6.4	24	10	3	1,044	538
3	41.0	6.5		44	7	4	1,072	535
4	55.0	8.7	7.0	63	10	6	1,146	582
5	56.3	13.7		66	16	2	1,172	558
6	68.2	8.6	5.9	79	10	5	1,158	569
7	63.2	2.6		74	3	2	1,171	615
8	52.2	5.0	1.9	63	6	1	1,207	563
9	32.8	6.0		33	6	1	1,007	513
10	45.5	2.2	1.7	49	4		1,077	542
11	31.0			28	3		903	461
12	33.9			31		2	915	467
13	22.9			19	3	1	829	401
14	17.8			15		1	844	430

[1] Rates for all ages under 15 are adjusted for differences in age distribution within the 15-year span (using the three 5-year age groups only) by the *direct* method as described in note to table 1.

[2] Of the 56 circumcisions under 1 year of age, 40 were under 1 month of age, a monthly rate of 110 per 1,000 male live births which, on an annual basis, is equal to 1,322 per 1,000 male live births.

Table 3 shows rates by single years of age for three operations that occur largely in childhood. The tonsillectomy rate under 1 year is low; after that age the rates rise continuously to a maximum of 68 per 1,000 at 6 years and 63 at 7 years. After this peak the frequency decreases rapidly as age increases; the rate at 14 years is about the same as among 1- and 2-year-old children.

Ear and mastoid operations show a maximum of 14 per 1,000 at 5 years, but the rates at all of the ages under 5 are relatively high, ranging from 7 to 10 as compared with 2 per 1,000 at 10 to 14 years.

A large part of the circumcisions were done under 1 year of age, the rate for that group being 116 per 1,000 males, as compared with a rate

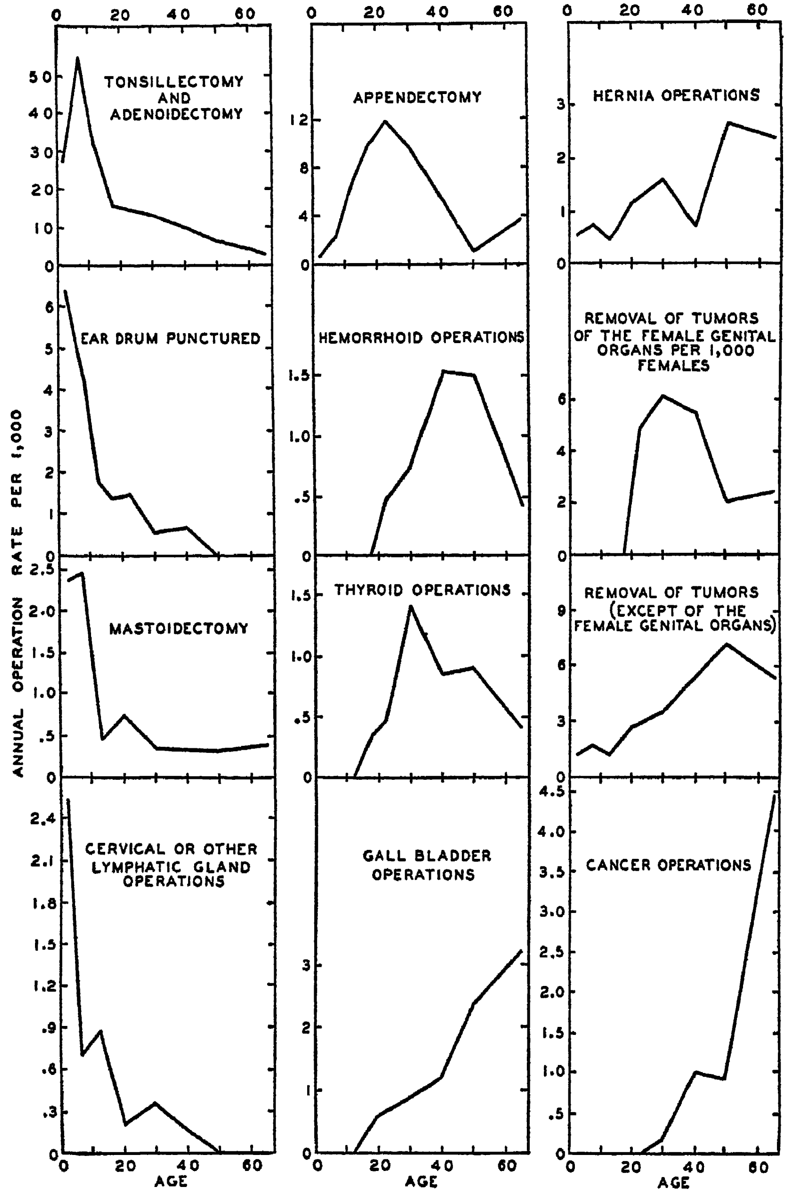

FIGURE 3.—Frequency of certain surgical operations at specific ages—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31. (Scales are so made that the adjusted rate for all ages represents an interval on the vertical rate scale that corresponds to 20 years on the horizontal age scale. In some instances the ages 15 to 24 are plotted as one group but shown in the tables as two groups.)

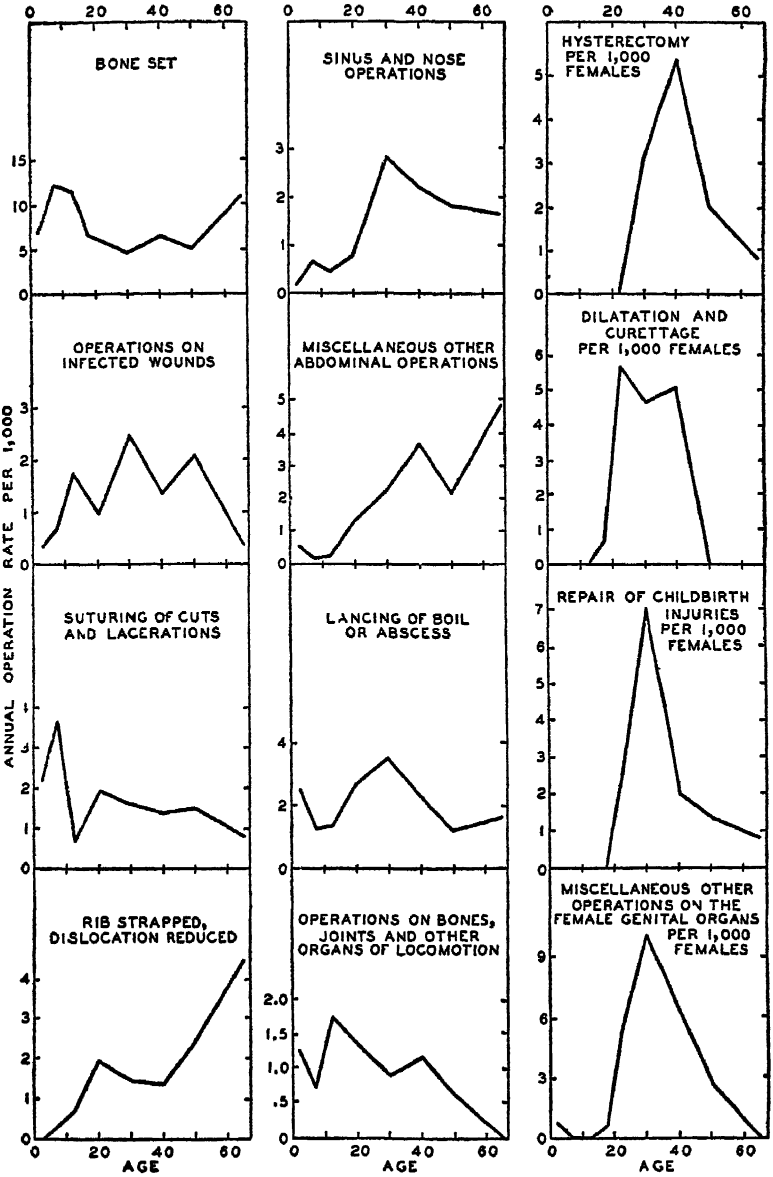

FIGURE 4 —Frequency of certain surgical operations at specific ages (continued)

of 12 for those who were 1 year of age, and rates under 10 per 1,000 for every other age group. Circumcisions under 1 month of age amount to 110 per 1,000 male live births; if circumcision continued at this frequency in the succeeding months of life, practically all male infants would be circumcised by the time they reached 9 months of age.

It was noted earlier that the rate for all surgical treatment was about the same for adult males and females when those operations that were not common to the two sexes were eliminated. Figure 5 shows rates (adjusted for age) for specific kinds of surgical treatment among males and females. It is seen that there are wide differences between the sexes in the frequency of certain operations. Aside from surgery in connection with accidental injuries, which is high among males, and appendectomy, which is high among females, the operations that show the largest relative differences between the sexes are hernia and sinus operations, with higher rates for males; and gall bladder, cancer, and thryoid operations, with higher rates for females. The incidence of all cases (surgical and nonsurgical) of the last three diagnoses and also of sinusitis and appendicitis is higher for females than for males, but hernia and accidents are definitely higher for males.

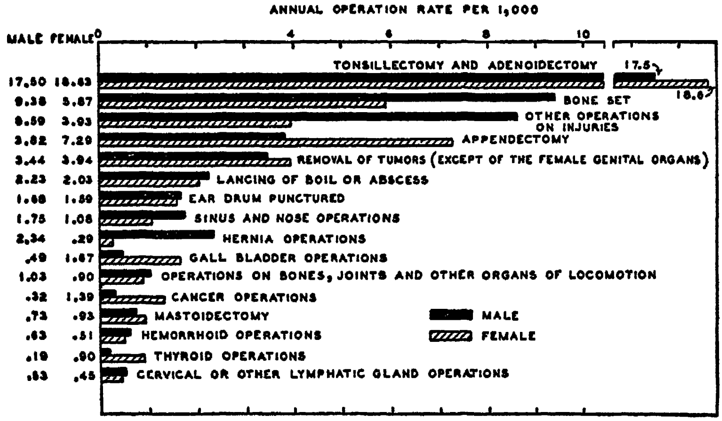

FIGURE 5 —Frequency of certain surgical operations among males and females in 8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31 (Rates adjusted to the age distribution of the white population of the registration States in 1930, adjustment was by the *direct* method for the first 6 operations (table 4), but by the *indirect* method for the other less frequent operations)

Table 4 and figure 6 show for the more frequent surgical operations the age incidence for males and females separately. It is here seen that the similarity in age incidence in the two sexes for all operations common to both groups is also misleading; an extremely high rate of appendectomy among females of the young adult ages is balanced by high rates for operations in connection with injuries among males of

TABLE 4.—*Frequency of certain surgical operations among males and females of specific ages—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Nature of operation	All ages[1]			Age								
	Number of operations	Adjusted[2]	Crude	Under 5	5–9	10–14	15–19	20–24	25–34	35–44	45–54	55 and over
		Annual operation rate per 1,000 males and females										
Tonsillectomy and adenoidectomy:												
Male	404	17.50	21.38	23.9	58.2	27.8	14.4	13.4	12.9	11.1	4.9	1.6
Female	441	18.03	22.47	30.6	52.2	34.4	16.4	14.7	13.3	8.8	7.3	3.2
Ear and mastoid operations:												
Male	63	2.41	3.33	10.7	6.4	3.5	1.3	2.2	.4	.7	------	------
Female	60	2.52	3.06	6.7	7.9	.9	3.3	1.6	1.2	1.4	.7	.8
Appendectomy:												
Male	66	3.82	3.49	.7	1.8	5.2	5.9	6.7	7.1	3.7	.5	2.4
Female	136	7.29	6.93	.4	3.1	8.4	13.8	15.5	11.4	7.1	1.3	4.9
Miscellaneous other abdominal operations:												
Male	71	4.81	3.76	1.1	1.8	1.3	2.0	3.4	5.4	3.0	7.6	14.5
Female	69	4.12	3.52	1.1	------	------	.7	7.4	4.3	8.1	6.6	6.5
Lancing of boil or abscess:												
Male	39	2.23	2.06	2.1	1.1	1.3	3.3	1.1	2.5	2.7	1.6	3.2
Female	44	2.03	2.24	3.0	1.4	1.3	4.6	.8	4.3	1.7	.7	------
Removal of tumors (except of the female genital organs):												
Male	58	3.44	3.07	1.1	2.1	.9	3.3	2.2	3.8	5.4	4.3	5.6
Female	67	3.94	3.41	1.5	1.4	1.3	2.6	2.4	3.4	5.4	10.6	4.9
Operations on the female genital organs: Female	219	11.32	11.16	.8	------	------	1.3	18.8	31.2	24.4	8.0	4.1
Circumcision: Male	94	3.17	4.97	27.4	3.9	1.7	------	------	.4	------	.5	------
Bone set:												
Male	192	9.38	10.16	8.9	17.4	16.1	11.1	10.1	5.8	8.1	5.4	5.6
Female	104	5.87	5.30	4.1	6.9	6.6	2.0	2.4	3.7	4.7	4.0	10.3
Operations on injuries (except setting of bone):												
Male	157	8.59	8.31	5.7	8.2	6.5	6.6	12.3	11.2	8.7	9.8	8.1
Female	79	3.93	4.03	3.7	4.2	4.4	3.3	3.3	5.6	3.4	2.7	4.1
Miscellaneous other operations:												
Male	119	6.45	6.31	6.8	5.0	5.6	4.0	4.5	8.3	7.0	5.4	8.9
Female	141	7.92	7.17	4.1	3.8	2.6	4.6	6.5	9.9	10.8	12.0	12.2
	Population (years of life)											
Male	18,896	------	------	2,808	2,820	2,301	1,527	894	2,402	2,979	1,845	1,241
Female	19,627	------	------	2,684	2,895	2,267	1,523	1,225	3,238	2,951	1,506	1,230

[1] "All ages" includes a few of unknown age.
[2] Adjusted by the *direct* method as described in note to table 1.

those ages. The high rate for males for operations in connection with injuries might be expected, in view of the greater incidence of industrial accidents among men and the greater frequency of accidents of all kinds among boys than girls (*11*). The excess of appendectomies among women is greatest at 20–24 years, but the relative difference is large at all ages above 5 years. One immediately thinks of the common practice of removing the appendix in connection with other abdominal operations, such as those on the female genital organs. Of the 136 appendectomies on females, in 37 there was some other operation performed at the same time, and 26 of these were in connection with female genital diseases; as 17 of these female genital operations would probably involve an abdominal incision, the appendix may have been removed without clinical appendicitis. Even if it be assumed that the entire 26 cases were appendectomies without clinical appendicitis and are excluded, the reported appendectomy rate for females would still be 60 percent above that for males. If the removal of the appendix in connection with other operations is important in the excess in the recorded appendectomy rate for females, a considerable number of such removals must have been reported with no mention of the primary disease or operation.

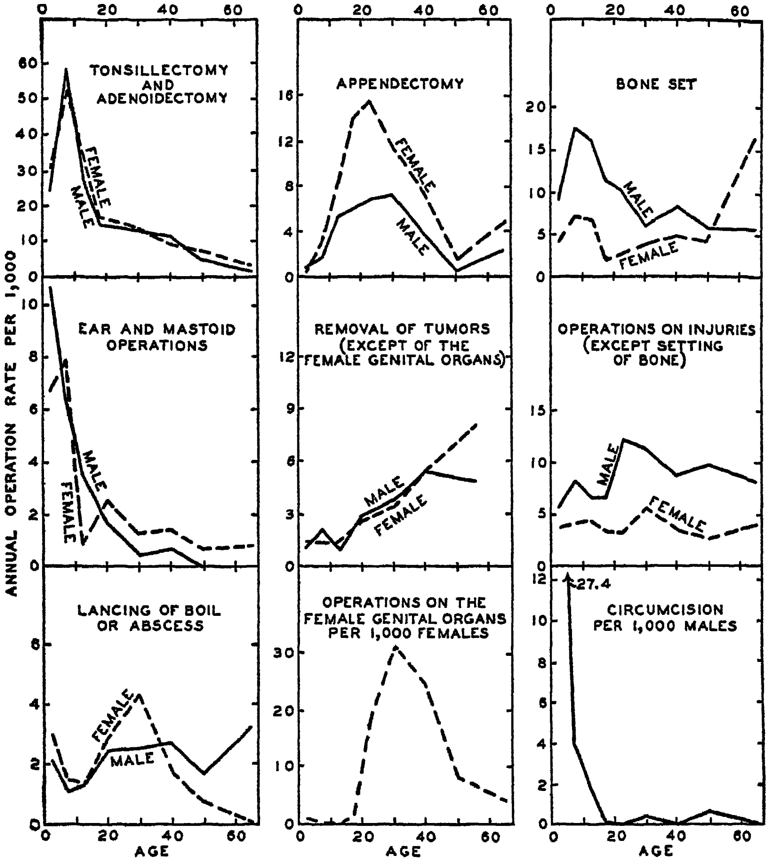

FIGURE 6.—Frequency of certain surgical operations among males and females of specific ages—8,758 canvassed white families in 18 States during 12 consecutive months, 1928-31. (Scales are so made that the adjusted rate for all ages of both sexes represents an interval on the vertical rate scale that corresponds to 20 years on the horizontal age scale. In some instances the ages 15 to 24 are plotted as one group but shown in the tables as two groups.)

Marital status.—Table 5 shows the incidence of surgical treatment among single and married persons. Among females the rate for all operations is definitely higher for married women below 30 years of age, but there is no difference at 30–34 years. When surgery in connection with female genital and puerperal diagnoses is eliminated, the differences between the rates for single and married women are not statistically significant[9] for any age group and are not consistent in the several groups. The rate for single males at 20–24 years is just enough above that for married males to be statistically significant; probably more of the single males are economically able to pay for surgery, or if in college they may get it as a part of provided medical care.

TABLE 5.—*Frequency of all surgical operations among single and married males and females of specific ages—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Age and marital status	Annual operation rate per 1,000 population						Number of operations				Population (years of life)		
	All operations			All operations except male and female genital and puerperal			All operations		All operations except male and female genital and puerperal				
	Both sexes	Male	Female	Both sexes	Male	Female	Male	Female	Male	Female	Both sexes	Male	Female
Total 20-34:													
Single	62.4	61.8	62.9	59.1	60.7	57.3	57	56	56	51	1,812	922	890
Married	75.8	55.8	89.3	55.7	55.8	55.6	132	313	132	195	5,869	2,364	3,505
20-24:													
Single	65.0	63.7	66.5	64.2	63.7	64.8	42	38	42	37	1,230	659	571
Married	67.5	34.3	79.6	42.3	34.3	45.2	8	51	8	29	874	233	641
25-29:													
Single	44.0	57.8	31.4	41.2	52.0	31.4	10	6	9	6	364	173	191
Married	76.6	56.8	89.4	55.6	56.8	54.9	47	114	47	70	2,103	828	1,275
30-34:													
Single	78.0	55.6	93.8	59.6	55.6	62.5	5	12	5	8	218	90	128
Married	77.8	59.1	93.1	59.8	59.1	60.4	77	148	77	96	2,892	1,303	1,589

Table 6 shows rates for 5 types of operations among single and married persons 20–34 years of age. The only statistically significant difference between single and married persons of the same sex is the large excess in operations in connection with female genital and puerperal diagnoses for married women. With the small numbers involved, the other differences are not greater than might be expected by chance.

TABLE 6.—*Frequency of certain surgical operations among single and married males and females of the ages 20–34 years—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Nature of operation	Annual operation rate per 1,000 population				Number of operations			
	Male		Female		Male		Female	
	Single	Married	Single	Married	Single	Married	Single	Married
Tonsillectomy and adenoidectomy	14.1	12.7	18.0	12.6	13	30	16	44
Appendectomy	6.5	7.2	13.5	12.3	6	17	12	43
Operations on the female genital organs	-------	-------	5.6	33.7	-------	-------	5	118
Operations on injuries	24.9	16.1	6.7	8.3	23	38	6	20
Miscellaneous other operations	16.3	19.9	19.1	22.5	15	47	17	79
Population (years of life)	-------	-------	-------	-------	922	2,364	890	3,505

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[9] More than one operation for the same individual during the year occurred so rarely that the probable error has been used throughout this study as though no person had more than one operation.

III. VARIATION IN THE FREQUENCY OF SURGICAL PROCEDURES WITH ECONOMIC STATUS

The proportion of operations done in an emergency that demands immediate action to save life is not large; probably the majority are planned leisurely and done at a previously scheduled time. Because of the large number of non-emergency operations, one would expect more surgery among the higher income groups of families where funds are available for medical care that is not immediately necessary.

Occupation.—Table 7 and figure 7 show operation rates (adjusted for age) per 1,000 males and females classified by broad occupational groups. Rates for females are shown for all surgery and for all except operations in connection with female genital and puerperal diagnoses. For males, operations were about twice as frequent among professional and business men as among unskilled laborers; clerks and skilled laborers fall logically between these extremes, with a slightly higher frequency for the clerical group. For females, all classes of labor are combined; and here, likewise, operations are twice as frequent in the professional and clerical as in the laboring group. Housewives fall midway between the two employed classes when operations in connection with female genital and puerperal diagnoses are eliminated.

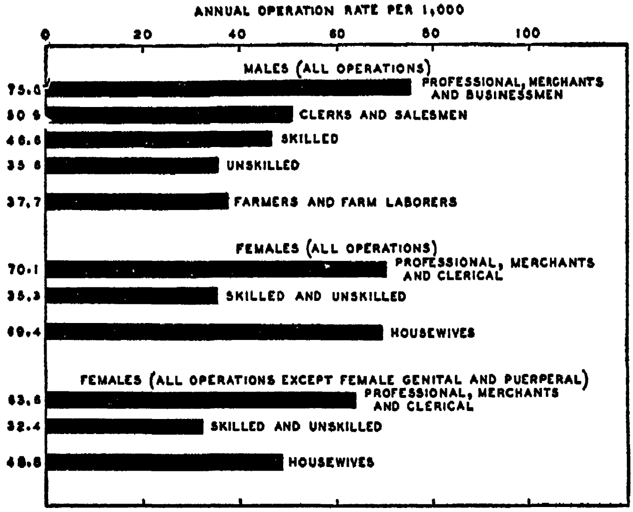

FIGURE 7.—Frequency of all surgical operations among males and females 15–64 years of age engaged in different classes of occupations—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31. (Rates adjusted to the age distribution of the white population 15–64 years of age in the registration States in 1930.)

TABLE 7.—*Frequency of all surgical operations in different occupational groups—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Sex and occupational group	Number of operations, all ages 15–64	Annual operation rate per 1,000 population				Population		
		All ages, 15–64		Age		All ages 15–64	Age	
		Adjusted[1]	Crude	15–34	35–64		15–34	35–64
	All operations							
Males:								
Professional, merchant, and businessmen	143	74.9	72.3	72.4	72.3	1,978	525	1,453
Clerks and salesmen	75	50.9	51.2	52.2	50.4	1,464	690	774
Skilled and semiskilled labor	132	46.6	46.5	56.7	39.6	2,838	1,146	1,692
Unskilled labor	41	35.6	35.8	29.0	42.9	1,146	586	560
Farmers and farm laborers	35	37.7	36.5	57.9	26.3	958	311	647
Females:								
Professional, merchant, and clerical	90	70.1	73.0	62.9	97.5	1,233	874	359
Skilled and unskilled labor	14	35.3	35.3	43.7	20.8	396	252	144
Housewives	589	69.3	74.6	86.5	65.3	7,897	3,444	4,453
	All operations except female genital and puerperal							
Females:								
Professional, merchant, and clerical	81	63.6	65.7	56.1	89.1	1,233	874	359
Skilled and unskilled labor	13	32.4	32.8	30.7	20.8	396	252	144
Housewives	391	48.8	49.5	53.1	46.7	7,897	3,444	4,453

[1] Rates for the age group 15–64 years are adjusted for differences in age distribution within that span by the *indirect* method as described in note to table 8.

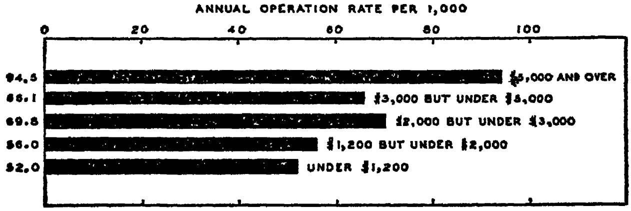

FIGURE 8.—Frequency of all surgical operations among persons classified according to total annual family income—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31. (Rates adjusted to the age distribution of the white population of the registration States in 1930.)

Income.—Data were obtained on the family's total income during the approximate year of the study. Since surgery usually involves considerable expense, one would expect more operations in the higher-income brackets. Table 8 and figure 8 show the frequency of surgery in each of five income groups, with adjustment of the rates for age differences among the various groups. The rates vary from 52 operations per 1,000 persons in families with annual incomes of less than $1,200 to 94 in families with $5,000 or more income. Between these extremes there is a gradual increase with income in the frequency of surgical treatments, except for a slightly smaller rate in the $3,000–$5,000 class than in the next lower income group.

TABLE 8.—*Frequency at specific ages of all surgical operations among canvassed families of different income levels in 18 States during 12 consecutive months, 1928–31*

Annual family income	All ages[1]			Age								
	Number of operations	Adjusted[2]	Crude	Under 5	5–9	10–14	15–19	20–24	25–34	35–44	45–54	55 and over
		Annual operation rate per 1,000 population										
Under $1,200	319	52.0	54.8	54.1	73.7	66.4	38.8	41.8	55.5	51.1	43.6	41.5
$1,200 but under $2,000	802	50.0	59.8	60.5	86.8	52.1	31.6	45.1	69.5	59.4	34.0	41.8
$2,000 but under $3,000	698	69.8	73.5	92.7	90.1	56.3	61.8	91.9	81.0	60.3	53.8	68.0
$3,000 but under $5,000	331	66.1	68.0	71.4	93.5	85.1	38.5	66.5	92.5	59.5	41.1	43.6
$5,000 and over	439	94.5	93.6	114.9	161.3	97.2	94.5	88.7	80.2	90.5	59.5	71.0
		Population										
Under $1,200	5,820	------	------	902	936	783	464	311	703	744	390	506
$1,200 but under $2,000	13,419	------	------	2,216	2,178	1,612	983	732	2,158	1,902	926	670
$2,000 but under $3,000	9,491	------	------	1,370	1,409	1,118	728	479	1,482	1,576	799	500
$3,000 but under $5,000	4,911	------	------	532	642	517	441	301	735	857	511	344
$5,000 and over	4,689	------	------	383	502	504	434	327	536	807	689	465

[1] "All ages" includes a few of unknown age.

[2] Rates for all ages are adjusted by the *indirect* method to the age distribution of the white population of the registration States in 1930. Briefly, this method involves the following steps: Age specific rates from tables 1, 2, or 4, for the whole canvassed population are used as "standard rates" and multiplied by the canvassed population of specific ages for a given subgroup (for example, income under $1,200) to obtain expected numbers of cases for the computation of an expected rate for all ages; when this rate is related to the adjusted rate for the corresponding surgical operation or group of operations in table 2 (adjustment there was by *direct* method), one obtains an "adjustment factor" which is of the nature of a percentage correction for differences in age distribution. This adjustment or correction factor is applied to the crude rate in the particular subgroup (for example, income under $1,200) to obtain the adjusted rate. The details of the process are given under the heading "standardized death-rates" in Pearl (*18*, pp. 265–269).

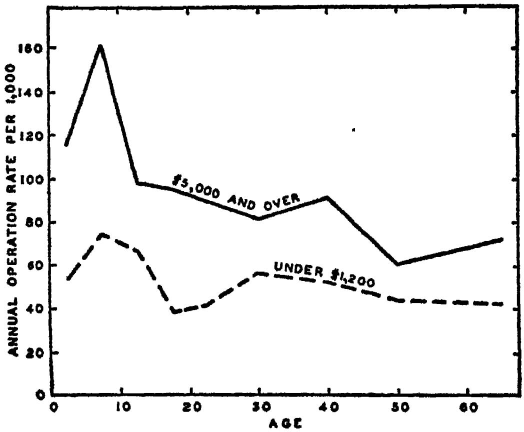

FIGURE 9.—Frequency of all surgical operations at specific ages among persons with high and with low total annual family income—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31.

As related to illness, surgery is also more frequent in the higher income groups; the percentage of diagnoses that were treated surgically increases from 6.6 percent for families with less than $1,200 income per year to 8.8 percent in the class with $5,000 or more.

Table 8 also shows rates for persons of specific ages and figure 9 shows them graphically for the lowest and highest income groups. The differences between these two extreme groups are large and consistent in the various ages. Reference to table 8, however, shows that for specific ages there is no regular increase with income in the operation rates for the intervening income groups. This lack of consistency in the relationship of the frequency of surgical treatment to income may be due partly to chance, for the numbers of cases in specific age and income classes are not large; the general tendency toward more operations in the higher income brackets is fairly clear.

Table 9 shows rates for each income group for 10 fairly specific types of operations, the rates being adjusted for age differences among the several income classes. These rates are plotted in the lower half

TABLE 9.—*Frequency of certain surgical operations among canvassed white families of different income levels in 18 States during 12 consecutive months, 1928–31*

Nature of operation	Annual operation rate per 1,000 population (age adjusted) [1]					Number of operations				
	Under $1,200	$1,200 but under $2,000	$2,000 but under $3,000	$3,000 but under $5,000	$5,000 and over	Under $1,200	$1,200 but under $2,000	$2,000 but under $3,000	$3,000 but under $5,000	$5,000 and over
All operations	51.98	55.98	69.83	66.12	94.48	319	802	698	334	439
Tonsillectomy and adenoidectomy	15.21	15.43	17 43	20.11	29 36	113	266	202	111	140
Ear and mastoid operations	1.34	2.00	2.18	2 84	6 45	11	38	27	16	30
Appendectomy	5.77	3.56	7.14	5.92	8 17	30	44	63	28	36
Miscellaneous other abdominal operations	4.14	3.93	4.32	3.67	6.28	19	40	33	16	29
Lancing of boil or abscess	1.42	1.48	2.84	2.05	3.82	8	20	27	10	17
Removal of tumors (except of the female genital organs)	1.43	1.60	5.10	3.20	8.68	7	18	43	15	42
Operations on the female genital organs (per 1,000 females)	7.21	12.96	12.62	9.11	10.65	18	84	62	25	27
Circumcision [2] (per 1,000 males)	1.74	2.62	4.86	3.04	2.73	9	31	36	9	6
Bone set	8.89	7.43	8.13	6.55	5.56	55	102	78	32	26
Operations on injuries (except setting of bone)	3.89	6.05	6.17	6.53	9.00	22	80	58	32	42
Miscellaneous other operations	5.07	6.40	7.73	8.43	9 51	27	79	69	40	44
Population	-------	-------	-------	-------	-------	5,820	13,419	9,491	4,911	4,689

[1] Adjusted by the *indirect* method as described in note to table 8.

[2] Circumcisions under 1 year of age per 1,000 male live births:

Annual family income	Male live births	Circumcisions under 1 year	Circumcision rate per 1,000 male live births
Under $1,200	83	6	72
$1,200 but under $2,000	139	18	129
$2,000 but under $3,000	87	22	253
$3,000 but under $5,000	32	7	219
$5,000 and over	19	3	158

of figure 10 on an actual basis, and in the upper half on a relative basis as ratios to the rate for the group with less than $1,200 annual income. Most of the operations show some tendency toward greater frequencies in the higher income groups. The operations that show the largest and most definite differences are tonsillectomy, removal of tumors, ear and mastoid operations, and lancing of boils. These types of operations are not usually done as emergencies; the tumor category is predominated by minor external tumors that do not endanger life, and the mastoid cases are a small part of the ear group. Moreover, the rupture of the ear drum in otitis media is a frequent outcome when surgical procedures are not used; by this outcome, the emergency is ended without surgery, although the result may be a permanent impairment.

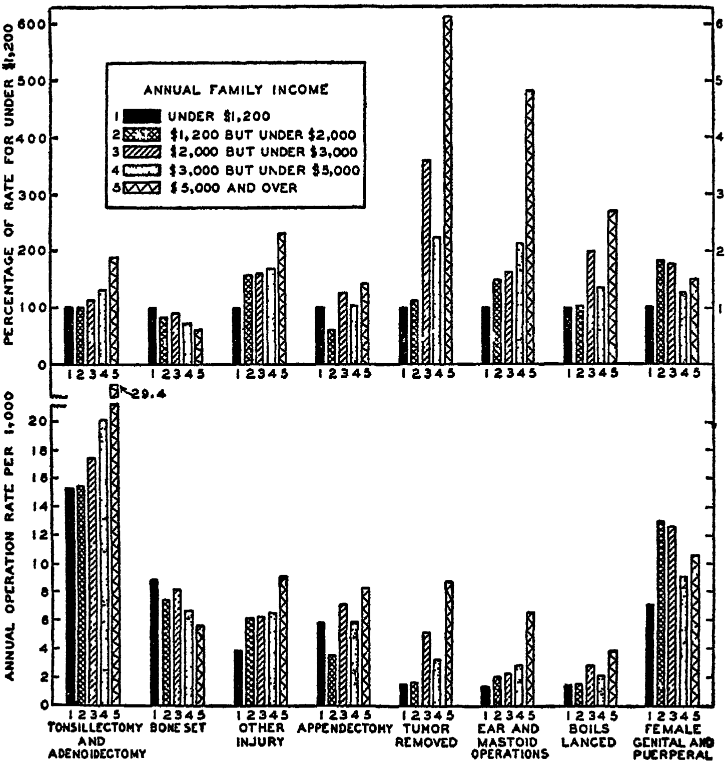

FIGURE 10.—Frequency of certain surgical operations among persons classified according to total annual family income—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31. (Rates adjusted to the age distribution of the white population of the registration States in 1930.)

Bone setting was more frequent in the lower income groups. Every fracture carries with it the implication of the setting of the bone or the placing of a cast, and so the frequency of this operation really represents the frequency of accidents involving a fracture. Since accidents, particularly industrial accidents, occur more frequently in the lower income groups, the incidence of this operation might be expected to be less in the higher income brackets. Operations in connection with injuries, except bone setting, are more frequent in the higher income groups; but when all operations on injuries are considered together, there is not much variation with income in the rate for all ages. Among children under 20 years there are more operations in the higher income groups (table 10).

TABLE 10.—*Frequency in broad age groups of certain surgical operations among canvassed white families of different income levels in 18 States during 12 consecutive months, 1928–31*

Diagnosis and age	Annual operation rate per 1,000 population for each income class					Number of operations				
	Under $1,200	$1,200 but under $2,000	$2,000 but under $3,000	$3,000 but under $5,000	$5,000 and over	Under $1,200	$1,200 but under $2,000	$2,000 but under $3,000	$3,000 but under $5,000	$5,000 and over
Tonsillectomy and adenoidectomy:										
Under 20	30.5	31.9	33.1	35.7	51.6	96	223	153	76	94
20–44	8.5	8.6	11.9	15.9	20.4	15	41	42	30	34
45 and over	2.2	1.3	5.4	5.9	7.8	2	2	7	5	9
Appendectomy:										
Under 20	4.8	1.9	3.7	6.6	9.9	15	13	17	14	18
20–44	7.4	5.8	11.9	6.9	9.0	13	28	42	13	15
45 and over	2.2	1.3	3.1	1.2	2.6	2	2	4	1	3
Operations on the female genital organs (per 1,000 females):										
Under 20	.7	.9	------	------	------	1	3	------	------	------
20–44	16.7	29.3	29.3	21.9	25.7	16	71	56	23	24
45 and over	2.3	6.8	10.0	4.9	5.6	1	5	6	2	3
Operations on injuries:										
Under 20	13.7	12.5	16.7	15.0	20.3	43	87	77	32	37
20–44	9.1	15.0	11.3	14.3	8.4	16	72	40	27	14
45 and over	20.1	13.8	14.6	5.9	13.9	18	22	19	5	16
Miscellaneous other operations:										
Under 20	11.5	16.5	24.9	17.3	36.2	36	115	115	37	66
20–44	17.1	16.9	22.3	24.3	31.7	30	81	79	46	58
45 and over	16.7	18.2	30.8	26.9	37.3	15	29	40	23	43
	Population of both sexes					Female population				
Under 20	3,145	6,939	4,625	2,132	1,823	1,529	3,495	2,307	1,075	899
20–44	1,758	4,792	3,537	1,893	1,670	957	2,528	1,913	1,051	935
45 and over	896	1,596	1,209	855	1,154	445	738	598	408	540

IV. VARIATION IN THE FREQUENCY OF SURGICAL PROCEDURES WITH SIZE OF CITY AND GEOGRAPHIC AREA

Physicians are more concentrated in large cities than is the general population; a study of 10 States by Peebles (*19*) indicated that 53 percent of the physicians were practicing in cities over 100,000 in population, whereas only about 40 percent of the population of these States lived in cities of that size. In addition, it was found that the percentage of practicing physicians who limited themselves to a specialty increased regularly with size of city; the percentage who were specialists in cities over 100,000 was more than four times what it was in places under 10,000.

Hospital beds are also concentrated in large cities, with corresponding scarcity in the rural districts. Thus surgeon specialists and hospital facilities are more plentiful and more convenient to the inhabitants of large cities.

Geographically, both physicians and hospital beds are less plentiful (in proportion to population) throughout the South than in other sections.

Size of city.—Figure 11 shows surgical operation rates for cities classified according to size. Considering this chart for the whole group of families, there is a regular progression from an operation rate of 48 in the rural areas to 73 per 1,000 in cities of 100,000 or more population. In table 11 these rates are shown for persons of specific ages. The variations among cities of different sizes are not consistent in the several age groups, but the tendency toward higher rates in large cities is fairly clear. When one compares operation rates in cities of 100,000 or over with those in rural areas, as is done in figure 12, the differences between the two types of communities are large for every age group.

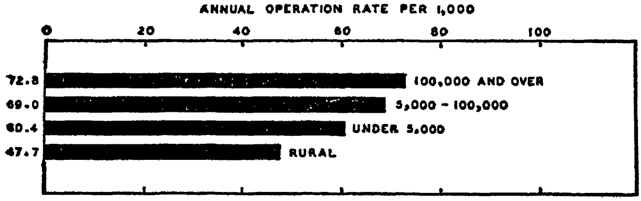

FIGURE 11.—Frequency of all surgical operations in cities of different sizes and in rural areas—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31. (Rates adjusted to the age distribution of the white population of the registration States in 1930.)

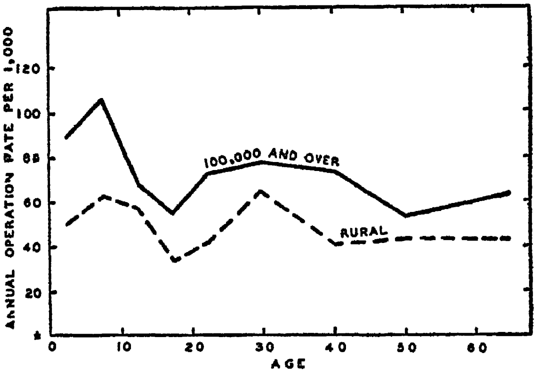

FIGURE 12.—Frequency of all surgical operations among persons of specific ages in large cities and in rural areas—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31.

TABLE 11.—*Frequency at specific ages of all surgical operations in cities of different sizes and in rural areas—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Size of city	All ages[1] Number of operations	All ages[1] Adjusted[2]	All ages[1] Crude	Age Under 5	Age 5–9	Age 10–14	Age 15–19	Age 20–24	Age 25–34	Age 35–44	Age 45–54	Age 55 and over
	Annual operation rate per 1,000 population											
Cities of 100,000 or over	1,093	72.8	76.2	88.6	106.3	67.8	54.0	72.6	77.7	72 9	52.9	62.8
Cities 5,000–100,000	707	69.0	72 9	71.7	107 5	70.5	62.0	77.2	73.3	64.8	41.1	58.6
Towns under 5,000	483	60.4	63 7	61.7	78.4	62.7	57.9	61.3	80.3	60 9	43.1	43.9
Rural areas	340	47.7	49.2	49 9	62.7	56.4	33.6	41.3	64 6	39.8	43.1	42.2
	Population (years of life)											
Cities of 100,000 or over	14,351	-------	-------	1,963	1,994	1,578	1,037	868	2,369	2,303	1,248	907
Cities 5,000–100,000	9,694	-------	-------	1,535	1,517	1,106	758	505	1,432	1,512	803	495
Towns under 5,000	7,585	-------	-------	1,134	1,199	909	570	359	1,096	1,134	627	524
Rural areas	6,914	-------	-------	881	1,005	975	685	387	743	981	673	545

[1] "All ages" includes a few of unknown age.
[2] Adjusted by the *indirect* method as described in note to table 8.

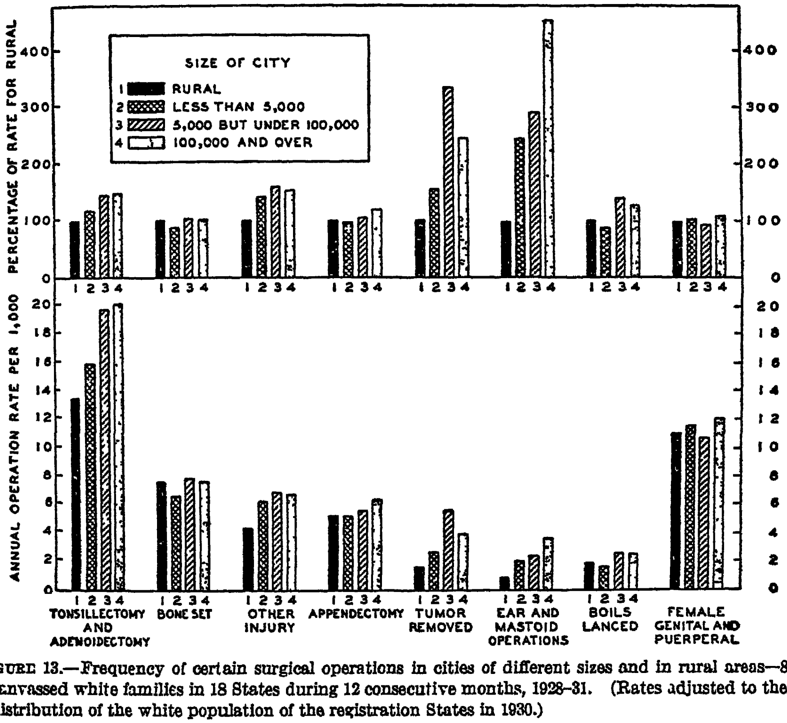

FIGURE 13.—Frequency of certain surgical operations in cities of different sizes and in rural areas—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31. (Rates adjusted to the age distribution of the white population of the registration States in 1930.)

Table 12 and figure 13 show rates for specific kinds of operations in the several types of communities. Most of the operations show tendencies toward higher rates in large cities, but the variations are not equally large and consistent for the several diagnoses. Tonsillectomy shows a regular progression from 13 per 1,000 in the rural areas to 20 per 1,000 in large cities, but for appendectomy there is much less difference between the country and the city. Possibly appendicitis represents an emergency which must be taken care of, but tonsillectomies are performed more frequently when facilities are available and convenient. The sizable excess in cities for operations to remove benign tumors, cysts, and warts seems to bear out this hypothesis, since such chronic conditions rarely come up as emergency situations. On the other hand, operations in connection with ear and mastoid diseases show a large relative excess for cities, and one would think that many of these operations would be done as emergencies. It is an emergency, however, that is often overlooked, and the eardrum is left to rupture without surgical interference. It seems hardly probable that the difference between urban and rural operation rates reflects only the need for such surgery.

TABLE 12.—*Frequency of certain surgical operations in cities of different sizes and in rural areas—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Nature of operation	Annual operation rate per 1,000 population (age adjusted [1])				Number of operations			
	Cities of 100,000 or over	Cities 5,000–100,000	Towns under 5,000	Rural areas	Cities of 100,000 or over	Cities 5,000–100,000	Towns under 5,000	Rural areas
All operations	72.78	68.97	60.39	47.69	1,093	707	483	340
Tonsillectomy and adenoidectomy	20.18	19.80	15.90	13.49	342	240	150	118
Ear and mastoid operations	3.61	2.34	1.96	.80	65	31	20	7
Appendectomy	6.26	5.55	5.11	5.17	85	49	35	33
Miscellaneous other abdominal operations	5.32	4.99	2.93	3.50	64	38	18	20
Lancing of boil or abscess	2.35	2.59	1.61	1.83	34	25	12	12
Removal of tumors (except of the female genital organs)	4.00	5.46	2.55	1.63	52	46	17	10
Operations on the female genital organs (per 1,000 females)	11.95	10.55	11.51	10.98	92	51	43	33
Circumcision [2] (per 1,000 males)	3.63	3.37	2.23	2.99	38	27	14	15
Bone set	7.72	7.92	6.65	7.59	111	78	52	55
Operations on injuries (except setting of bone)	6.65	6.91	6.15	4.29	95	60	46	29
Miscellaneous other operations	8.40	6.22	10.71	2.04	115	56	76	13
Population (years of life)	--------	--------	--------	--------	14,351	9,694	7,585	6,914

[1] Adjusted by the *indirect* method as described in note to table 8.

[2] Circumcisions under 1 year of age per 1,000 male live births:

Size of city	Male live births	Circumcisions under 1 year	Circumcision rate per 1,000 male live births
Cities of 100,000 or over	135	25	185
Cities 5,000–100,000	94	14	149
Towns under 5,000	81	9	111
Rural areas	53	8	151
All communities	363	56	154

Operations on the female genital organs are often done in connection with conditions that resulted from childbirth; because the birth rate is higher in rural areas the need for such surgery is probably greater there, but the operation rates in table 12 show little variation with size of city.

TABLE 13.—*Frequency in broad age groups of certain surgical operations in cities of different sizes and in rural areas—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Diagnosis and age	Annual operation rate per 1,000 population				Number of operations			
	Cities of 100,000 or over	Cities 5,000–100,000	Towns under 5,000	Rural areas	Cities of 100,000 or over	Cities 5,000–100,000	Towns under 5,000	Rural areas
Tonsillectomy and adenoidectomy:								
Under 20	39.0	38.2	30.7	25.9	256	188	117	92
20–44	13.9	12.2	10.4	8.1	77	42	27	17
45 and over	3.2	6.9	5.2	3.3	7	9	6	4
Appendectomy:								
Under 20	4.1	4.1	3.4	5.1	27	20	13	18
20–44	9.7	7.5	8.1	4.7	54	26	21	10
45 and over	1.9	1.5	.9	4.1	4	2	1	5
Operations on the female genital organs (per 1,000 females):								
Under 20	.6	.4	.5	-------	2	1	1	-------
20–44	27.3	25.7	28.1	23.1	82	48	40	26
45 and over	6.6	1.7	3.6	12.8	7	1	2	7
Operations on injuries:								
Under 20	14.8	18.5	13.4	11.0	97	91	51	39
20–44	13.2	11.3	12.0	13.7	73	39	31	29
45 and over	16.2	10.0	13.9	13.1	35	13	16	16
Miscellaneous other operations:								
Under 20	25.4	19.9	18.9	10.2	167	98	72	36
20–44	23.3	25.2	23.2	9.9	129	87	60	21
45 and over	32.5	28.5	21.7	16.4	70	37	25	20
	Population of both sexes				Female population			
Under 20	6,572	4,916	3,812	3,546	3,325	2,447	1,904	1,693
20–44	5,540	3,449	2,589	2,111	3,002	1,866	1,421	1,123
45 and over	2,155	1,298	1,151	1,218	1,056	578	555	547

Size of city and income.—Surgical operation rates are higher in large cities than in rural areas; they are also higher in families with larger incomes. Since the higher income families tend to be concentrated in large cities, it is necessary to consider size of city and family income simultaneously to see whether both factors are related to the operation rate. It was feasible in this study to do this by computing operation rates for families of different incomes in cities of specific sizes.

Figure 14 shows, for families of given income levels, operation rates for those that live in small towns and rural areas as compared with those in cities of two sizes (table 14). Thus the top three bars in figure 14 indicate that among families with annual incomes of $5,000 or more the frequency of surgical operations is nearly twice as high in cities over 100,000 as in rural areas. Also for families in the lowest income group, under $1,200 per annum, there is a large excess in the frequency of operations in large cities over that in small towns and rural areas. In both the high and low income groups the differences between the rates for large cities and for towns and rural areas are statistically significant; that is, they are larger than would be expected to occur by chance. In the intervening three income groups there is a fairly consistent tendency toward higher operation rates in the cities, but the differences are small and not statistically significant.

The data in figure 14 suggest that among families with sufficient income to pay for needed operations, the service is obtained more frequently in large cities where surgeons and hospital facilities are conveniently near. Persons in the lowest income group that live in large cities likewise obtain more surgical treatment, presumably because of the availability of at least a certain amount of free clinic and hospital service near at hand. In the three intervening income groups the convenience of facilities for surgical service in large cities does not greatly increase the frequency of operations because these families have incomes high enough to make them ineligible for free clinic and hospital service but not high enough to pay for surgery and the necessary hospital and nursing care that goes with it. While the need for surgical treatment may vary with size of city and family income, the differences noted above do not seem to be explained by variation in the need for surgery.

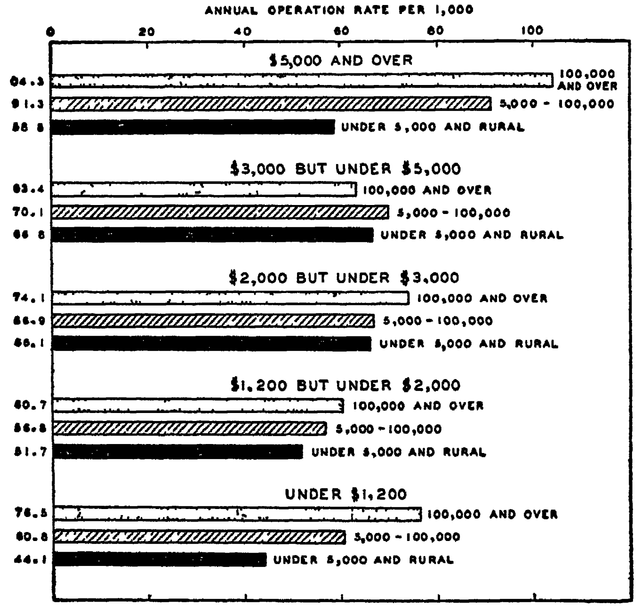

FIGURE 14.—Frequency of all surgical operations in cities of different sizes among persons classified according to total annual family income—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31. (Rates adjusted to the age distribution of the white population of the registration States in 1930.)

If one compares the bars in the various parts of figure 14, it is seen that the operation rate is lowest for low income rural families; however, the low income city families get as much surgical treatment as any group except city families with $5,000 incomes. While the recorded rate for high income rural families is less than for low income urban families, the numbers are small and the two rates are not significantly different. From table 15 it is seen that the frequency of operations for city families with incomes under $2,000 is practically the same as for rural families with annual incomes of $3,000 or more (62.9 and 64.6 per 1,000, respectively).

TABLE 14.—*Frequency of all surgical operations among canvassed white families of different income levels in metropolitan, urban, and rural parts of 18 States during 12 consecutive months, 1928–31*

Operation group and size of city	Annual operation rate per 1,000 population (age adjusted [1])					Number of operations				
	Under $1,200	$1,200 but under $2,000	$2,000 but under $3,000	$3,000 but under $5,000	$5,000 and over	Under $1,200	$1,200 but under $2,000	$2,000 but under $3,000	$3,000 but under $5,000	$5,000 and over
All operations:										
Cities of 100,000 or over	76.5	60.7	74.1	63.4	104.3	61	305	326	152	248
Cities 5,000–100,000	60.8	56.8	66.9	70.1	91.3	82	177	178	96	162
Towns under 5,000 and rural areas	44.1	51.7	66.1	66.8	58.8	176	320	104	86	29
All operations except male and female genital and puerperal:										
Cities of 100,000 or over	68.4	51.8	63.8	56.2	97.3	55	259	280	134	231
Cities 5,000–100,000	53.8	50.6	50.3	62.7	82.1	73	157	157	86	148
Towns under 5,000 and rural areas	39.9	42.7	55.3	60.9	52.1	161	266	163	79	26
Population:										
Cities of 100,000 or over						772	4,675	4,166	2,334	2,389
Cities 5,000–100,000						1,236	2,873	2,490	1,314	1,805
Towns under 5,000 and rural areas						3,812	5,871	2,835	1,263	495

[1] Adjusted by the *indirect* method as described in note to table 8.

Table 15 also shows rates for each of seven kinds of operations. In every instance in which there was a definite increase with income in the frequency of surgical treatment when size of city was disregarded, the increase persists in each of the three city-rural classes. The relative differences between income groups are particularly large for the removal of tumors and ear operations.

Geographic area.—The frequency of operations as reported in this study varies in different geographic areas as well as in cities of different sizes. Considering surgical treatment of all kinds, the West reported the highest frequency and the Northeast the lowest; the South and North Central were intermediate and had approximately the same rates. When the rates are considered for persons of different ages

TABLE 15.—*Frequency of certain surgical operations among canvassed white families of different annual incomes in metropolitan, urban, and rural parts of 18 States during 12 consecutive months, 1928–31*

Nature of operation	Cities of 100,000 or over			Cities of 5,000–100,000			Towns under 5,000 and rural areas		
	Under $2,000	$2,000 but under $3,000	$3,000 and over	Under $2,000	$2,000 but under $3,000	$3,000 and over	Under $2,000	$2,000 but under $3,000	$3,000 and over
	Annual operation rate per 1,000 population (age adjusted [1])								
All operations	62.9	74.1	83.8	58.0	66.9	82.1	48.8	66.1	64.6
Tonsillectomy and adenoidectomy	17.8	18.8	25.1	15.6	18.2	26.2	13.9	14.6	19.4
Ear and mastoid operations	2.7	2.6	6.1	1.9	2.3	3.2	1.2	1.4	2.5
Appendectomy	4.4	8.1	6.8	4.0	5.7	7.3	4.2	6.9	7.2
Lancing of boil or abscess	1.8	2.4	3.0	1.7	2.0	4.4	1.2	4.4	------
Removal of tumors (except of the female genital organs)	1.3	4.9	5.9	2.5	6.5	7.8	1.3	4.2	3.0
Operations on the female genital organs (per 1,000 females)	12.1	13.3	10.7	10.8	9.2	10.2	11.1	14.7	6.7
Operations on injuries	13.2	15.1	15.2	16.7	14.5	12.1	12.0	13.0	13.1
	Number of operations								
All operations	366	326	400	259	178	258	496	194	115
Tonsillectomy and adenoidectomy	123	96	123	87	57	90	169	49	38
Ear and mastoid operations	21	14	30	12	8	11	16	5	5
Appendectomy	22	32	31	15	13	21	37	18	12
Lancing of boil or abscess	10	10	14	7	5	13	11	12	------
Removal of tumors (except of the female genital organs)	6	18	28	8	14	24	11	11	5
Operations on the female genital organs (female)	33	29	30	21	12	16	48	21	6
Operations on injuries	72	63	71	69	36	38	118	37	23
	Population								
Both sexes	5,447	4,166	4,723	4,109	2,490	3,119	9,683	2,835	1,758
Female	2,794	2,142	2,515	2,095	1,247	1,549	4,837	1,448	887

[1] Adjusted by the *indirect* method as described in note to table 8.

there is no one section which stands out as consistently higher than the others.

Considering the various kinds of operations in the four geographic areas (table 16), the larger differences tend to occur in the minor operations and may be due in part to variation in the completeness of the family reports. For example, the tonsillectomy rate varies from 14 per 1,000 in the Northeast to 22 per 1,000 in the West, and circumcisions under 1 year of age per 1,000 male live births vary from 78 in the Northeast to 286 in the West. The rate in the West is also particularly high for the removal of benign tumors and for ear and mastoid operations.

TABLE 16.—*Frequency of certain surgical operations in 4 geographic sections*[1]—*8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Nature of operation	Annual operation rate per 1,000 population (age adjusted [2])				Number of operations			
	Northeast	North Central	South	West	Northeast	North Central	South	West
All operations	58 35	62 79	63.26	79 24	547	930	517	599
Tonsillectomy and adenoidectomy	13 68	19.32	17.18	21 79	146	349	168	182
Ear and mastoid operations	2.45	1.96	1.88	4.22	28	38	20	37
Appendectomy	6 48	4 91	6 38	5.40	53	66	46	37
Miscellaneous other abdominal operations	3 86	5.03	4 38	4 16	30	57	26	27
Lancing of boil or abscess	2.84	2.08	1.83	1.94	25	30	14	14
Removal of tumors (except of the female genital organs)	3.15	3.44	2.76	5 48	26	43	18	38
Operations on the female genital organs (per 1,000 females)	10.57	9.22	14.78	13.02	47	67	55	50
Circumcision [3] (per 1,000 males)	1.44	2 84	2.89	6.64	10	33	18	33
Bone set	7.66	7.09	8.04	7.73	71	104	64	57
Operations on injuries (except setting of bone)	5.28	7.22	5.27	6.31	47	103	40	46
Miscellaneous other operations	7.45	5.22	6.79	11.05	64	70	48	78
Population (years of life)					9,043	14,413	7,741	7,347

[1] States included in the survey were as follows: *Northeast.*—New York, Massachusetts, Connecticut; *North Central.*—Illinois, Ohio, Michigan, Indiana, Wisconsin, Minnesota, Kansas; *South.*—District of Columbia, Virginia, West Virginia, Tennessee, Georgia; *West.*—Washington, California, Colorado.

[2] Adjusted by the *indirect* method as described in note to table 8.

[3] Circumcisions under 1 year of age per 1,000 male live births:

Geographic section	Male live births	Circumcisions under 1 year	Circumcision rate per 1,000 male live births
Northeast	77	6	78
North Central	151	16	106
South	65	14	215
West	70	20	286

Size of city and geographic area.—Figure 15 shows operation rates for cities of different sizes in each of the four geographic areas considered above. In each region the rates for rural areas and for towns under 5,000 are lower than in cities of 5,000 and over; the differences between the low rural rate and the highest city rate are statistically significant for every section. In the Northeast and North Central regions, where the great bulk of the large cities are located, the observed operation rates in cities over 100,000 are slightly but not significantly less than in cities of 5,000 to 100,000 population. In these sections a larger percentage of the population lives within a convenient distance of the facilities of large cities, so less difference between the rates for urban and rural places might be expected, even with equal need for surgical treatment. However, there seems to be no reasonable explanation, in terms of either need or facilities, for the high rates reported for all types of communities in the West and for large cities in the South.

V. SEVERITY AND MEDICAL CARE OF SURGICAL CASES

Hospital, clinic, and specialist services.—Table 17 includes data on the kind of service received in connection with each of the 26 more or less specific types of operations. Considering all surgical treatment, 61 percent of the cases had some hospital service, and presumably the operation was done in the hospital. Of the 39 percent that had no hospital service, 30 percent of all operations had only office or clinic calls, with no home calls, and so the operation must have been done in the office or clinic; the other 9 percent had home calls but no hospital service, and so the operation was done either at home or in the office or clinic.

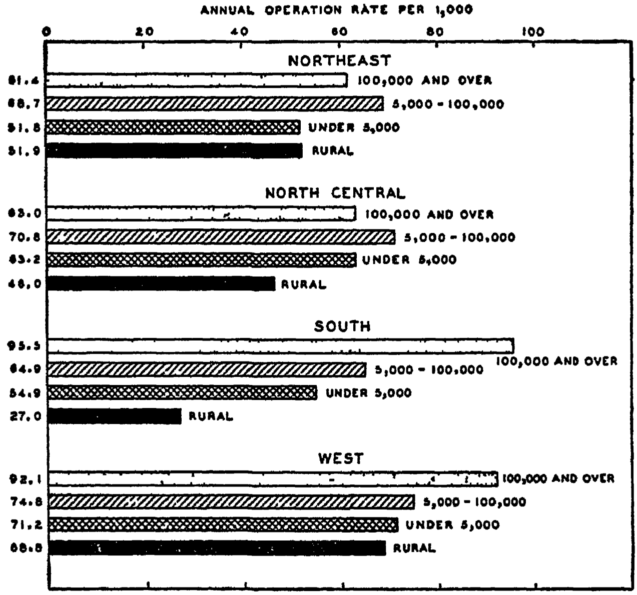

FIGURE 15.—Frequency of all surgical operations in cities of different sizes and in rural areas in each of four geographic sections of the United States—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31. (Rates adjusted to the age distribution of the white population of the registration States in 1930.)

All operations for gall bladder, hernia, and thyroid and all hysterectomies were hospital cases. Other operations in which 90 percent or more of the cases had hospital service were appendectomy, 99 percent; mastoid, 95; tumors of the female genital organs, 94; and repair of lacerations following childbirth, 92 percent. At the other extreme, only 12 percent of the ear punctures had hospital service and 45 percent had office calls only. Seventeen percent of the operations on boils and abscesses were done in the hospital, but 63 percent had only office calls. Considering all operations in connection with accidents, 27 percent had hospital service; the range for the various types of

TABLE 17.—*Place of treatment and type of service for surgical cases of certain kinds—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Nature of operation	All operations						Hospital operations	
	Total number	Percentage with specified medical care				Percentage specified as done by a specialist[2]	Total number	Percentage specified as done by a specialist[2]
		Hospital service	Home calls but no hospital service	Office or clinic calls only	Public clinic service[1]			
All operations	2,623	60.8	9.4	29.8	10.1	43	1,596	53
Tonsillectomy and adenoidectomy	845	75.1	2.4	22.5	12.7	50	635	54
Sinus and nose operations	50	64.0	4.0	32.0	6.0	82	32	91
Ear drum punctured	84	11.9	42.9	45.2	17.9	68	10	70
Mastoidectomy	39	94.9	5.1		10.3	82	37	81
Cervical or other lymphatic gland operations	26	38.5	30.8	30.8	11.5	38	10	50
Thyroid operations	19	100.0			15.8	74	19	74
Appendectomy	202	99.0	1.0		1.5	54	200	55
Hernia operations	43	100.0			4.7	53	43	53
Gall bladder operations	31	100.0			6.5	74	31	74
Miscellaneous other abdominal operations	66	89.4	1.5	9.1	6.1	67	59	69
Hemorrhoid operations	20	70.0		30.0	15.0	55	14	57
Operations on bones, joints, and other organs of locomotion	40	72.5	5.0	22.5	15.0	50	29	62
Lancing of boil or abscess	83	16.9	20.5	62.7	2.4	14	14	29
Cancer operations	21	85.7		14.3	4.8	76	18	78
Removal of tumors (except of the female genital organs)	125	23.2	3.2	73.6	4.8	43	29	59
Removal of tumors of the female genital organs	48	93.7	2.1	4.2	8.3	46	45	47
Hysterectomy	31	100.0			3.2	65	31	65
Dilatation and curettage	38	78.9	18.4	2.6	2.6	34	30	37
Repair of childbirth injuries	36	91.7	5.6	2.8	13.9	53	33	55
Miscellaneous other operations on the female genital organs	66	65.2	12.1	22.7	4.5	33	43	42
Circumcision	94	40.4	24.5	35.1	6.4	11	38	16
Bone set	293	26.7	21.3	52.0	13.5	14	79	22
Rib strapped, dislocation reduced	50	10.0	26.0	64.0	4.0	6	5	40
Suturing of cuts and lacerations	70	25.7	10.0	64.3	24.3	19	18	39
Operations on infected wounds	49	32.7	12.2	55.1	14.3	16	16	25
Miscellaneous other operations on injuries	67	40.3	13.4	46.3	16.4	30	27	37
Miscellaneous other operations	84	60.7	15.5	23.8	6.0	52	51	59

[1] Includes all public clinic service with or without hospital or other service.

[2] Specialist includes all types and surgeons not otherwise designated; it does not include hospital or clinic staff with no information as to whether specialists.

accident was from 26 to 40 percent, except 10 percent for operations to strap a rib or reduce a dislocation.

The figure of 61 percent of surgical cases that were hospitalized may be contrasted with 3.4 percent of all nonsurgical cases; 4.4 percent of nonsurgical cases that had a doctor in attendance were hospitalized. Of interest also is the fact that 60 percent of all hospital cases had surgical operations, as compared with 3.2 percent of all nonhospital cases; 4.2 percent of nonhospital cases that had a doctor in attendance had an operation. Hospitalization is frequent in surgical practice and surgery looms larger in hospital than in nonhospital medical practice.

Of the 1,596 operations of all kinds with hospital service, 92 percent were in general hospitals; 1.8 percent in children's hospitals; 1.1 in eye, ear, nose and throat hospitals; 0.6 in women's hospitals; and the remaining 4.5 percent were in other or unspecified types of hospitals. About 33 percent of the surgical cases were in a general ward, 22 percent in a semiprivate ward, and 45 percent in a private room. The variation in these figures from one kind of operation to another is not great; the only ones that stand out as different are circumcision, 55 percent in general wards; operations in connection with injuries, 46 percent in general wards; and tonsil and adenoid operations, 38 percent in general wards.

Of all surgical cases, 10.1 percent received some service from a public clinic in connection with the illness, as compared with 3.3 percent for all nonsurgical cases, and with 4.3 percent for nonsurgical cases that had an attendant. Of the total of 266 surgical cases that received some clinic service, 35 percent designated the organization as a general clinic, 12 percent as an eye, ear, nose, or throat clinic, 3.4 percent as a children's clinic, 1.1 percent a woman's clinic, and 4.1 percent as other known types of clinics The remaining 45 percent of the cases that had clinic service had hospital service also, and the type of the clinic was not tabulated; nearly all of such cases were in general hospitals.

Table 17 shows for each type of operation the proportion done by a specialist. In 43 percent of all the operations the surgery was reported as done by a specialist; in comparison, only 10 percent of nonsurgical attended cases had a specialist as a medical attendant. The operations may be further classified according to the nature of the specialty; 18 percent of all operations were done by eye, ear, nose, or throat specialists (chiefly tonsillectomies and ear and mastoid cases), 21 percent by surgeons not otherwise designated as to specialty, 1.0 percent by orthopedic specialists, 1.0 by gynecologists, 0.6 by internal medicine specialists, 0.4 by urologists, and 1.4 percent by other designated specialists. The other 57 percent of the operations were done by physicians not designated as specialists, including 12 percent that were done by hospitals or clinics with no other information about the person who operated. Fifty-three percent of all operations in hospitals were done by specialists, as compared with 27 percent of those done outside of hospitals. Table 17 shows for each type of operation the percent of hospital surgical cases in which the surgery was done by a specialist.

Nursing service.—Table 18 shows certain facts about nursing care in connection with the various operations. Because nursing on surgical cases was largely in the hospital, the tabulation is limited to a special nurse in the hospital. As every hospital case receives during every day in the hospital the attention of the regular floor nurse, the table shows also the percentage of cases that were in the hospital and the average days per hospitalized case. In addition, 25 percent of the hospital surgical cases had one or more special nurses for at least one day and 9 percent had two or more special nurses (day and night) for one or more days. These percentages may be contrasted with 17 percent of nonsurgical hospital cases that had one or more special nurses and 6 percent that had two or more.

The mean duration of special nursing in the hospital was 2.9 days per hospital surgical case and 11.5 days per hospital surgical case with a special nurse.[10] The proportion of hospital surgical cases that had a special nurse varies from 5 percent for circumcisions and 10 percent for tonsillectomies to 36 percent for operations on the female genital organs, 50 percent for hernia, gall bladder, and other abdominal operations, and 52 percent for appendectomies.

TABLE 18.—*Nursing service on surgical cases in a hospital—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Nature of operation	Number of surgical cases		Percent of surgical cases that were in a hospital	Mean days in hospital per hospital case	Special nurse in hospital		Percent of hospital cases that had a special nurse in the hospital		
	Total	In hospital			Mean days [1] per hospital case	Mean days [1] per hospital case with special nurse	Any special nurse	One nurse (day or night)	Two or more nurses (day and night)
All operations	2,623	1,596	60.8	9.6	2.9	11.5	25.3	16.4	8.9
All operations except male and female genital and puerperal	2,300	1,366	59.4	9.1	2.6	10.5	24.4	15.9	8.5
Tonsillectomy and adenoidectomy	845	635	75.2	2.0	.3	3.1	10 1	7.1	3.0
Ear and mastoid operations	123	47	38.2	10.4	7.2	22.7	31.9	8.5	23.4
Appendectomy	202	200	99.0	14.6	4.0	7.7	52.0	40.0	12.0
Miscellaneous other abdominal operations	140	133	95.0	19.6	8.6	17.4	49.6	27.8	21.8
Lancing of boil or abscess	83	14	16.9	5.6	3.9	13.5	28.6	21.4	7.1
Removal of tumors (except of the female genital organs)	125	29	23.2	7.3	2.6	10.9	24.1	17.2	6.9
Operations on the female genital organs	219	182	83.1	13.1	5.9	16.5	35.7	23.1	12.6
Circumcision	94	38	40.4	3.6	.1	2.0	5.3	5.3	--------
Bone set	296	79	26.7	22.3	2.5	19.5	12.7	8.9	3.8
Operations on injuries (except setting of bone)	236	66	28.0	9.1	1.8	9.2	19.7	12.1	7.6
Miscellaneous other operations	260	173	66.5	16.7	3.7	12.0	31.2	16.8	14.4

[1] A day of nursing refers to the work of 1 nurse during a day or night or both; 2 nurses (day and night) on the same case were counted as 2 days of nursing but 1 nurse said to be on duty both day and night was counted as only 1 day of nursing.

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[10] In both of these averages a day refers to the work of one nurse during a day or night or both; two nurses (day and night) on the same case were counted as two days nursing, but one nurse said to be on duty both day and night was counted as only one day of nursing.

Considering all cases[11] without respect to hospitalization, 16.3 percent of all surgical cases had a full-time bedside nurse (graduate or practical) for one or more days, as contrasted with 2.1 percent of all nonsurgical cases. However, the services of the regular floor nurse in the hospital should be taken into account; of the total surgical cases, 61.7 percent were either in a hospital (and therefore had nursing care) or had the services of a full-time bedside nurse outside of the hospital, as contrasted with 4.9 percent for all nonsurgical cases, and with 6.3 percent for nonsurgical cases that were attended by a doctor.

Of all surgical cases, 5.0 percent had one or more visits from a visiting nurse; this may be compared with 3.7 percent of nonsurgical cases that had such service. The service on surgical cases amounted to 0.42 visit per total case and 8.5 visits per case with a visiting nurse. Nursing visits as here defined include visits for any purpose and from all types of organizations.

Durations of illness and of hospital service.—Table 19 shows for the 26 more or less specific kinds of operations the mean total duration[12] in days of sickness, the duration of days in bed, and number of days in a hospital for the illness in connection with which the surgery was performed. Since the duration of the case may have been materially increased by complicating affections, the means here shown are for illnesses with only a single diagnosis. The table also shows the percentages of cases that were in bed and that were hospitalized, together with the average duration of the bed and hospital cases in terms of bed and hospital days, respectively.

Figure 16 shows the mean duration in the hospital for hospitalized cases. Thus the cases that were not in a hospital do not enter into the computation, and for some operations (e. g., ear punctured, boil lanced, and reduction of dislocation), the hospitalized cases represent a small proportion of the total. The means thus represent the average stay in the hospital for cases that came under hospital care, or, roughly, the expectancy of hospital days for an uncomplicated surgical case of a given diagnosis.

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[11] Inasmuch as the operations included sole, primary, and contributory diagnoses, the percentages here and in other paragraphs for nonsurgical cases also refer to all three kinds of diagnoses; the results are not essentially different when contributory diagnoses are eliminated.

[12] Theoretically, statistics on the duration of illness should exclude all incomplete cases and be based only on those closed either by death, recovery, or other discharge from the hospital or discontinuance of confinement to bed. In this study, however, the only available records were durations during the 12-month period of observation; in such data the incomplete cases represent a selected group with longer than average durations because the longer the duration the more probable it is that the case will still be sick on the closing date of the study year. On the other hand, some illnesses of short duration may represent cases with onset prior to the beginning of the study that extended only a short time within the study year.

TABLE 19.—*Mean duration of symptoms, of time in bed and of time in the hospital for certain surgical cases in which there were no complicating diagnoses—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Nature of operation	Number of surgical cases with only 1 diagnosis	Percent of cases that were in hospital	Mean days in hospital		Percent of cases that were in bed	Mean days in bed		Mean days of sickness per case (disabling and nondisabling)
			Per total case	Per case in hospital		Per total case	Per case in bed	
All operations	2,277	57.8	4.7	8.2	75.3	7.7	10.3	28
Tonsillectomy and adenoidectomy	795	75.2	1.3	1.7	96.9	3.0	3.2	8
Sinus and nose operations	42	61.9	2.8	4.5	81.0	5.3	6.6	31
Ear drum punctured	58	8.6	.3	4.0	70.7	4.4	6.3	17
Mastoidectomy	29	96.6	9.3	9.6	96.6	14.4	14.9	52
Cervical or other lymphatic gland operations	20	40.0	1.2	3.1	75.0	9.4	12.5	44
Thyroid operations	19	100.0	14.1	14.1	100.0	15.2	15.2	85
Appendectomy	154	98.7	13.3	13.5	100.0	16.3	16.3	31
Hernia operations	34	100.0	14.3	14.3	100.0	19.1	19.1	47
Gall-bladder operations	23	100.0	21.6	21.6	100.0	24.1	24.1	67
Miscellaneous other abdominal operations	52	88.5	17.3	19.6	94.2	19.3	20.5	63
Hemorrhoid operations	15	73.3	8.5	11.6	80.0	10.3	12.8	54
Operations on bones, joints, and other organs of locomotion	37	70.3	19.0	27.1	73.0	36.4	49.8	105
Lancing of boil or abscess	76	13.2	.7	5.2	39.5	1.8	4.6	22
Cancer operations	15	80.0	19.7	24.6	80.0	20.1	25.2	201
Removal of tumors (except of the female genital organs)	114	18.4	1.1	6.0	24.6	1.6	6.5	24
Removal of tumors of the female genital organs	23	87.0	14.5	16.7	95.7	21.3	22.2	54
Hysterectomy	24	100.0	16.3	16.3	100.0	26.3	26 3	91
Dilatation and curettage	32	78.1	4.5	5.8	96.9	10.1	10.4	39
Repair of childbirth injuries	11	81.8	10.3	12.6	90.9	12.8	14.1	74
Miscellaneous other operations on the female genital organs	60	61.7	5.6	9.1	80.0	10 4	13.0	32
Circumsion	80	35.0	1.2	3.3	71.2	2.4	3 3	7
Bone set	282	24 5	5.1	20.7	40.4	10.3	25 4	43
Rib strapped, dislocation reduced	48	10.4	.6	6.0	31.2	1.3	4.1	21
Suturing of cuts and lacerations	68	23 5	.8	3.4	45.6	2.8	6.1	14
Operations on infected wounds	44	29.6	2.0	6.9	38.6	3.5	9.1	33
Miscellaneous other operations on injuries	66	39.4	3.8	9.7	50.0	7 4	14.8	28
Miscellaneous other operations	56	46.4	9.0	19.5	66.1	14.4	21.7	36

At the top of the list, with an average of 27 hospital days, are operations on the bones, joints, and other organs of locomotion, including deformities, malformations, and amputations. The other three operations with hospital durations of more than 20 days are cancer, 25 days; gall bladder, 22 days; and bone set or cast placed, 21 days. At the bottom of the list appear tonsil and adenoid operations with an average hospital duration of 1.7 days. A total of 75 percent of the tonsillectomies were done in a hospital. However, of those done in a hospital, 68 percent of the patients spent only 1 day and 26 percent spent only 2 or 3 days in the hospital. Thus the very frequent operation of tonsillectomy gives rise to a low average duration for all operations, 8.2 hospital days per hospitalized case with only one diagnosis.

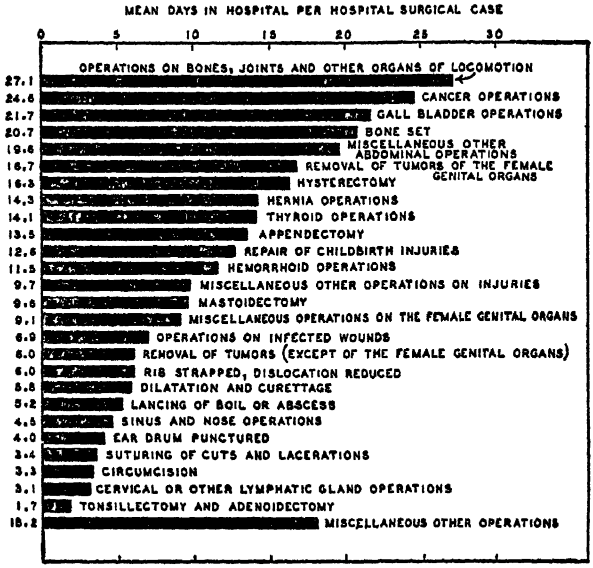

FIGURE 16.—Average days in the hospital for illnesses hospitalized in connection with certain surgical operations—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31. (Means are based on hospitalized cases with only one diagnosis; days in the hospital both before and after the operation are included.)

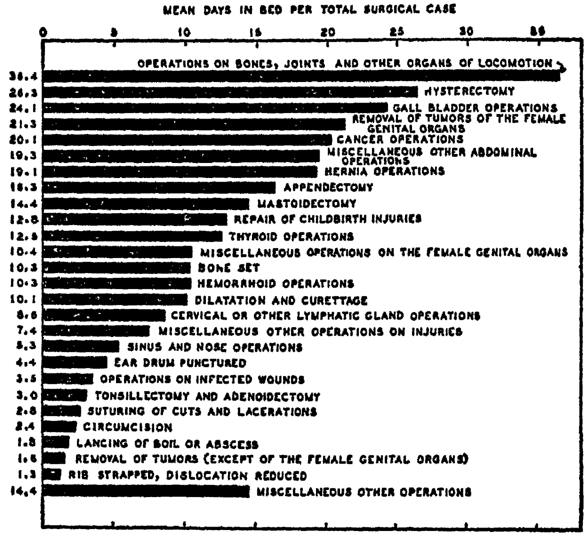

FIGURE 17.—Average days in bed on account of illness in connection with certain surgical operations—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31. (Means represent the average time in bed both before and after operation for all cases with only one diagnosis, including those not in bed at all.)

Figure 17 shows the mean time in bed for all cases, including those who were not in bed as well as those who were confined to bed. It thus represents the average severity of all cases of a given operation with only one diagnosis. At the head of the list with an average of 36 days in bed are operations on the bones, joints, and other organs of locomotion. Following this comes hysterectomy with a mean of 26 days in bed; gall bladder, 24 days; tumors of the female genital organs, 21 days; and cancer, 20 days in bed. At the other end of the list are the minor operations that cause little or no time in bed, including strapping of a rib or reduction of a dislocation, 1.3 days; benign tumors, except of the female genital organs, 1.6 days; and lancing of a boil or abscess, 1.8 days in bed. The most frequent of the short duration cases are tonsillectomies with an average duration in bed of 3.0 days; since this operation constitutes nearly one-third of the total, the duration for all operations combined is short, 7.7 days in bed.

For a smaller number of diagnoses more detailed data on the duration in the hospital and in bed are shown in tables 20 and 21, respectively. These tables show mean durations for cases with only one diagnosis and for those with two or more diagnoses; the distributions according to duration are confined to cases with only one diagnosis as more nearly representing the illness associated with a given kind of operation. As might be expected, the mean durations for complicated cases are uniformly longer than for cases with only one diagnosis.[13]

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[13] The numbers of deaths are too small to give any reliable data on case fatality but they may be worth recording here. Death was occasionally the reason for a family being discontinued from the study; therefore, data for families under observation for less than 12 months are added to those for the families under observation the whole 12-month period. Among 8,390 individuals in the part-time families there were 4,236 full-time years of life with 278 operations and 5 deaths. The following table includes operations and deaths from sole, primary, and contributory causes in both full and part-time families:

Nature of operation	Number of operations during study	Number of cases that terminated fatally during the study	Percentage fatal
All operations	2,901	38	1.3
Tonsillectomy and adenoidectomy	949		
Ear and mastoid operations	130	3	2.3
Appendectomy	225	4	1.8
Miscellaneous other abdominal operations	154	8	5.2
Lancing of boil or abscess	89	2	2.2
Removal of tumors (except of the female genital organs)	133	1	.8
Operations on the female genital organs	237	3	1.3
Circumcision	101		
Operations on injuries	591	4	.7
Miscellaneous other operations	292	14	4.8

One of the deaths occurred in connection with a case that had both gall bladder and appendicitis operations, so the total deaths equal one less than the sum of the separate classes

TABLE 20.—*Distribution according to the time in the hospital for certain surgical hospital cases in which there were no complicating diagnoses, and mean duration in hospital for complicated and uncomplicated cases—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Nature of operation	Cases with only 1 diagnosis (uncomplicated)																Cases with 2 or more diagnoses (complicated)		
	Number of surgical cases		Percent of cases that were in hospital	Average days in hospital			Percent of hospital cases that were in the hospital the specified number of days										Number of surgical cases in hospital	Percent of all surgical cases that were in hospital	Mean days in hospital per case in hospital
	Total	In hospital		Mean days per total case	Per case in hospital		Total hospital cases	1	2–3	4–5	6–8	9–11	12–17	18–24	25–45	40 or more			
					Mean days	Median days													
All operations	2,277	1,317	57.8	4.7	8.2	3	100.0	36.7	16.5	6.1	7.9	7.9	13.8	6.1	3.3	1.7	279	80.6	16.5
All operations except male and female genital and puerperal	2,040	1,167	57.2	4.4	7.7	2	100.0	40.0	17.4	4.9	7.5	7.5	12.5	5.6	3.0	1.6	199	70.5	17.2
Tonsillectomy and adenoidectomy	795	598	75.2	1.3	1.7	1	100.0	68.0	25.8	3.4	1.2	.5	.8	.2	.2	------	37	74.0	6.1
Ear and mastoid operations	87	33	37.9	3.3	8.8	7	100.0	6.1	12.1	21.2	18.2	18.2	9.1	15.2	------	------	14	38.9	14.4
Appendectomy	154	152	98.7	13.3	13.5	12	100.0	------	------	.7	13.8	26.3	43.4	9.2	6.6	------	48	100.0	18.1
Miscellaneous other abdominal operations	109	103	94.5	17.3	18.3	14	100.0	1.9	2.9	3.9	6.8	10.7	33.0	23.3	12.6	4.8	30	96.8	21.0
Lancing of boil or abscess	76	10	13.2	.7	5.2	3	100.0	30.0	20.0	20.0	20.0	------	------	10.0	------	------	4	57.1	6.5
Removal of tumors (except of the female genital organs)	114	21	18.4	1.1	6.0	5	100.0	23.8	23.8	9.5	23.8	4.8	9.5	4.8	------	------	8	72.7	10.6
Operations on the female genital organs	150	115	76.7	8.8	11.5	10	100.0	2.6	8.7	17.4	13.9	12.2	27.0	12.2	5.2	.9	67	97.1	15.9
Circumcision	90	28	35.0	1.2	3.3	1	100.0	66.7	8.3	8.3	------	8.3	8.3	------	------	------	10	71.4	4.5
Bone set	282	69	24.5	5.1	20.7	7	100.0	25.8	12.1	4.6	15.2	4.5	12.1	4.5	7.6	13.6	10	71.4	33.4
Operations on injuries (except setting of bone)	226	60	20.6	1.9	7.1	4	100.0	25.4	23.7	8.5	13.6	10.2	8.5	5.1	5.1	------	6	60.0	29.2
Miscellaneous other operations	204	128	62.7	10.0	16.0	9	100.0	12.8	10.4	10.4	16.0	12.8	17.6	10.4	4.0	5.6	45	80.4	18.9

TABLE 21.—*Distribution according to time in bed for certain surgical cases in which there were no complicating diagnoses, and mean duration in bed for complicated and uncomplicated cases—8,758 canvassed white families in 18 States during 12 consecutive months, 1928–31*

Nature of operation	Cases with only 1 diagnosis (uncomplicated)																	Cases with 2 or more diagnoses (complicated)		
	Number of surgical cases		Percent of surgical cases that were in bed	Average days in bed			Percent of all cases that were in bed the specified number of days											Total number of surgical cases	Percent of surgical cases that were in bed	Mean days in bed per total case
	Total	In bed		Mean days per total case	Per case in bed		Total cases	Not in bed	1	2–3	4–5	6–8	9–11	12–17	18–24	25–45	46 or more			
					Mean days	Median days														
All operations	2,277	1,715	75.3	7.7	10.3	4	100.0	24.7	8.9	25.0	9.0	6.7	6.0	8.0	5.7	4.1	1.9	346	95.7	25.1
All operations except male and female genital and puerperal	2,040	1,516	74.3	7.3	9.9	4	100.0	25.7	9.4	26.3	9.0	6.0	5.7	7.3	5.2	3.8	1.7	260	94.2	26.6
Tonsillectomy and adenoidectomy	795	770	96.9	3.0	3.1	2	100.0	3.1	19.0	52.7	16.5	4.9	2.3	.8	.6	.1	------	50	96.0	12.6
Ear and mastoid operations	87	69	79.3	7.8	9.8	7	100.0	20.7	3.4	13.8	6.9	20.7	13.8	8.0	9.2	3.4	------	36	94.4	14.1
Appendectomy	154	154	100.0	16.3	16.3	14	100.0	------	------	.6	------	3.9	26.0	38.3	19.5	10.4	1.3	48	100.0	29.8
Miscellaneous other abdominal operations	109	106	97.2	20.3	20.8	19	100.0	2.8	1.8	1.8	1.8	4.6	11.0	22.9	26.6	22.9	3.7	31	96.8	38.7
Lancing of boil or abscess	76	30	39.5	1.8	4.6	3	100.0	60.5	5.3	17.1	6.6	4.0	4.0	2.6	------	------	------	7	71.4	12.7
Removal of tumors (except of the female genital organs)	114	28	24.6	1.6	6.5	5	100.0	75.4	1.8	9.6	1.8	6.1	------	3.5	1.8	------	------	11	81.8	7.5
Operations on the female genital organs	150	135	90.0	14.7	16.4	13	100.0	10.0	2.0	2.0	9.3	14.7	11.3	21.3	16.7	8.0	4.7	69	100.0	24.1
Circumcision	80	57	71.2	2.4	3.3	2	100.0	28.8	10.0	37.5	10.0	10.0	3.8	------	------	------	------	14	100.0	5.6
Bone set	282	114	40.4	10.3	25.4	10	100.0	59.6	2.1	8.2	3.6	5.0	2.8	4.3	4.6	3.9	6.0	14	85.7	46.6
Operations on injuries (except setting of bone)	226	96	42.5	4.0	9.3	4	100.0	57.5	7.5	11.5	5.3	5.8	2.6	4.0	2.6	2.2	.9	10	90.0	19.2
Miscellaneous other operations	204	156	76.5	16.2	21.2	10	100.0	23.5	2.9	14.2	7.8	8.8	8.3	12.8	5.9	9.8	5.9	56	94.6	38.9

Informants tend to report the durations of the illnesses in such terms as 3, 5, and 10 days; 1, 2, and 3 weeks; or in months only. Because of this tendency to round off the duration in days or to report it only in weeks or months, the class intervals in these tables are arranged to center on these round figures. Thus 6–8 days, 12–17 days, and 18–24 days represent approximately 1, 2, and 3 weeks, respectively. In spite of these various sources of error the average duration is probably a fairly reliable figure.

The durations in the hospital (table 20) are in general rather similar to those in bed (table 21). The average days in the hospital are slightly less than in bed, because of time in bed during convalescence after leaving the hospital or in the acute stages before going to the hospital.

Some of the data in table 21 for cases with only one diagnosis may be summarized. Appendectomy represents an average of 16.3 days in bed, with nearly one-third of the cases in bed more than 18 days. The miscellaneous abdominal operations, including hernia and gall bladder, have an average duration of 20 days in bed per total case, with more than one-fourth in bed more than 25 days. Only about 40 percent of the injuries that have surgical treatment have any time in bed. While 97 percent of the cases with tonsillectomy are in bed for one or more days, the average is only 3 days, and less than 10 percent are in bed for more than 5 days.

VI. SUMMARY

Records of all surgical operations were obtained for 8,758 white families in 130 localities in 18 States for a period of 12 consecutive months between 1928 and 1931. Each family was visited at intervals of 2 to 4 months to obtain the data.

The surveyed families include representation from nearly all geographic sections, from rural, urban, and metropolitan areas, from all income classes, and of both native- and foreign-born persons. With respect to income, the distribution was reasonably similar to the estimated distribution of the general population of the United States at the time of the survey.

Considering the whole surveyed group there were 65 surgical operations per 1,000 persons per year. The rates for males and females were 62 and 68 per 1,000, respectively. The highest rates occurred at 5–9 and 30–34 years of age. The first peak is largely accounted for by tonsillectomy and the second by female genital and puerperal conditions (fig. 1).

Tonsillectomy constituted nearly one-third of all operations. The setting of a fractured bone was second in frequency, appendectomy third, and the removal of benign tumors (exclusive of female genital organs) was fourth in frequency (fig. 2).

The age curves of the various types of operations differ radically (figs. 3 and 4).

The setting of a fractured bone, other operations in connection with injuries, hernia, and sinus operations were all definitely higher among males than females. Appendectomy, gall bladder, cancer, and thyroid operations were definitely higher among females (figs. 5 and 6).

The frequency of operations increased definitely with income (figs. 8 and 9). The largest relative variations with income occurred in the removal of tumors and ear and mastoid operations (fig. 10). Operations were more frequent among professional and business men than among laborers (fig. 7).

Operations were more frequent in large cities than in rural districts (figs. 11, 12, and 15).

Sixty-one percent of all operations had some hospital service; the other 39 percent were done in the office or clinic or at home.

VII. REFERENCES

Preceding Papers in this Series

(*1*) Collins, Selwyn D.: Causes of illness in 9,000 families. Pub. Health Rep., **48**: 283–308 (Mar. 24, 1933). (Reprint 1563.)

(*2*) ———— Frequency of health examinations in 9,000 families. Pub. Health Rep., **49**: 321–346 (Mar. 9, 1934.) (Reprint 1618.)

(*3*) ———— Frequency of eye refractions in 9,000 families. Pub. Health Rep., **49**: 649–666 (June 1, 1934). (Reprint 1627.)

(*4*) ———— A general view of the causes of illness and death at specific ages. Pub. Health Rep., **50**: 237–255 (Feb. 22, 1935). (Reprint 1673.)

(*5*) ———— Age incidence of illness and death considered in broad disease groups. Pub. Health Rep., **50**: 507–525 (Apr. 12, 1935). (Reprint 1681.)

(*6*) ———— Age incidence of specific causes of illness. Pub. Health Rep., **50**: 1404–1427 (Oct. 11, 1935). (Reprint 1710.)

(*7*) ———— History and frequency of smallpox vaccinations and cases in 9,000 families. Pub. Health Rep., **51**: 443–479 (Apr. 17, 1936). (Reprint 1740.)

(*8*) ———— History and frequency of typhoid fever immunizations and cases in 9,000 families. Pub. Health Rep., **51**: 897–926 (July 10, 1936). (Reprint 1758.)

(*9*) ———— History and frequency of diphtheria immunizations and cases in 9,000 families. Pub. Health Rep., **51**: 1736–1773 (Dec. 18, 1936). (Reprint 1789.)

(*10*) ———— History and frequency of clinical scarlet fever cases and of injections for artificial immunization among 9,000 families. Pub. Health Rep., **53**: 409–427 (Mar. 18, 1938). (Reprint 1917.)

Other References

(*11*) ———— The health of the school child. Pub. Health Bulletin No. 200. Government Printing Office, Washington, D. C. (August 1931).

(*12*) Falk, I. S., Klem, Margaret C., and Sinai, N.: The incidence of illness and the receipt and costs of medical care among representative families. Publication No. 26 of the Committee on the Costs of Medical Care, University of Chicago Press, 1933.

(*13*) Halsted, William S.: The training of the surgeon. Am. Med., **8**: 69–75 (July 9, 1904).

(*14*) Maes, Urban: Aseptic surgical technique. Chapter 7 of Vol. I of Practice of Surgery, Edited by Dean D. Lewis and others, W. F. Prior Co., Hagerstown, Md., 1937.

(*15*) Matas, Rudolph: William Stewart Halsted, an appreciation. Bull. Johns Hopkins Hosp., **36**: 2–27 (January 1925).

(*16*) Osler, Sir William: The Evolution of Modern Medicine. Yale University Press, New Haven, 1923.
(*17*) Owen, Edmund: Article on surgery in Encyclopedia Brittannica, **26**: 125–132, 13th ed., New York.
(*18*) Pearl, Raymond: Medical Biometry and Statistics, 2d Edition. W. B. Saunders Co., 1930.
(*19*) Peebles, Allon: Medical facilities in the United States. Publication No. 3 of the Committee on the Costs of Medical Care, Washington, D. C., 1929.

MATERNAL MORTALITY RATES, BY STATES, 1926–36, AND DEATHS AND DEATH RATES FROM ALL PUERPERAL CAUSES, 1932–36

According to the number of inquiries received by the Public Health Service, the rate tables for maternal and infant mortality would stand well up in a list of vital statistics data in which professional persons, health workers, and members of the public in general are interested. A rate table for infant mortality was published in the PUBLIC HEALTH REPORTS for June 25, 1937, and it is believed that the maternal mortality rates for the registration area and for each State, just released by the Bureau of the Census, will be found both interesting and useful. In the first accompanying table these data are shown for the 11 years from 1926 to 1936, inclusive. This rate table is supplemented by data from a special report issued by the Bureau of the Census showing the deaths and death rates from the various puerperal causes upon which the aggregate maternal mortality rates are based. These data are given for the 5-year period, 1932 to 1936.

Maternal mortality rate—number of puerperal deaths[1] per 1,000 live births, 1926–36[2]

Area	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936
Birth registration States	6.6	6.5	6.9	7.0	6.7	6.6	6.3	6.2	5.9	5.8	5.7
Alabama	(3)	8.0	9.4	9.9	9.0	8.1	7.6	7.5	6.4	6.2	7.4
Arizona	10.2	8.9	7.7	7.8	6.5	8.2	8.1	6.5	5.9	5.8	9.1
Arkansas	(3)	9.0	8.8	9.1	9.4	7.1	6.6	7.8	6.4	6.2	7.8
California	5.6	5.8	6.1	5.7	5.1	6.2	5.6	4.6	4.3	4.5	4.7
Colorado	(3)	(3)	9.6	8.0	7.4	7.0	7.4	6.2	7.5	7.3	7.1
Connecticut	5.8	5.5	5.3	5.4	4.9	4.3	4.8	5.0	4.7	4.3	4.1
Delaware	9.3	5.9	5.6	6.3	6.5	7.1	8.2	6.9	5.8	6.4	7.1
District of Columbia	7.7	8.6	8.5	7.0	9.0	7.1	9.0	5.0	3.8	6.7	6.9
Florida	10.7	11.0	10.1	9.5	10.2	10.4	10.1	11.5	8.4	8.7	8.1
Georgia	(3)	(3)	10.7	9.3	10.6	9.9	9.2	7.5	7.6	7.3	8.2
Idaho	5.7	6.0	6.8	6.1	6.5	5.1	5.3	4.3	6.2	6.3	4.4
Illinois	6.5	5.6	5.7	6.8	5.5	5.5	5.6	5.0	5.2	5.0	4.5
Indiana	6.5	6.6	6.2	7.0	6.2	6.1	5.7	5.9	5.8	5.3	4.8
Iowa	6.0	5.9	4.8	5.6	5.9	5.0	5.4	5.3	5.1	5.4	4.6
Kansas	7.0	6.3	7.7	6.8	7.3	6.2	6.2	5.5	6.0	6.1	5.7
Kentucky	5.8	4.9	6.0	6.6	6.4	6.4	5.7	5.3	5.4	5.3	5.6
Louisiana	(3)	9.1	11.4	9.9	10.0	8.6	8.1	8.4	7.9	7.9	8.7
Maine	6.7	8.0	7.4	7.2	7.2	7.9	6.4	7.0	6.0	5.7	5.1
Maryland	5.8	5.8	6.5	5.5	5.6	6.1	5.1	5.0	5.2	5.4	4.7
Massachusetts	6.4	6.3	6.4	6.8	6.4	6.5	6.0	6.7	5.4	5.7	4.9
Michigan	6.7	6.8	6.6	6.6	6.2	6.0	6.0	6.1	5.7	5.3	5.2
Minnesota	5.7	4.4	5.7	4.3	5.3	4.9	4.8	4.4	4.5	4.7	4.2
Mississippi	7.9	8.7	9.4	8.9	9.6	8.0	6.3	7.3	6.6	6.7	6.9
Missouri	(3)	6.7	7.0	7.3	6.1	7.8	6.7	5.8	6.1	5.7	6.1

[1] Puerperal deaths include International List numbers 140–150.
[2] Vital statistics—Special Report, vol. 5, No. 16, Mar. 1, 1936, pp. 44–45. Bureau of the Census.
[3] Not added to birth registration area until a later date.

Maternal mortality rate—number of puerperal deaths[1] *per 1,000 live births, 1926–36* —Continued.

Area	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936
Montana	8.0	6.6	7.5	8.4	6.9	7.3	6.6	5.7	5.7	5.2	5.5
Nebraska	6.6	5.9	6.0	6.1	5.8	5.4	5.2	4.6	5.2	5.9	5.0
Nevada	(3)	(3)	(3)	6.3	10.5	9.8	6.3	8.1	6.3	7.7	5.6
New Hampshire	7.6	6.5	6.3	7.5	6.2	6.8	5.9	6.9	5.7	6.1	4.8
New Jersey	5.8	6.3	5.9	5.5	5.6	5.7	5.7	5.4	5.3	4.6	4.0
New Mexico	(3)	(3)	(3)	8.7	8.8	7.2	9.1	8.6	7.4	6.9	7.4
New York	5.7	6.1	5.9	5.6	5.6	5.9	5.9	6.2	5.3	5.8	4.9
North Carolina	8.8	6.6	7.8	8.4	8.3	8.0	6.8	6.8	7.1	6.5	6.6
North Dakota	4.3	5.1	5.7	5.5	5.8	4.9	4.4	4.9	4.7	5.3	4.3
Ohio	6.7	6.2	6.4	6.7	6.3	6.5	6.3	6.1	6.0	6.2	5.0
Oklahoma	(3)	(3)	7.1	8.2	6.9	6.2	7.2	6.5	6.0	5.9	6.2
Oregon	5.9	6.4	6.1	5.9	5.8	4.5	4.7	5.5	6.1	5.4	5.4
Pennsylvania	6.4	6.4	6.1	6.5	6.0	6.5	6.1	5.8	5.8	5.5	5.2
Rhode Island	6.0	6.4	6.0	7.9	5.7	5.5	6.0	5.7	5.5	4.4	4.0
South Carolina	(4)	(4)	10.9	11.4	11.4	10.2	9.4	8.0	8.7	9.5	9.0
South Dakota	(3)	(3)	(3)	(3)	(3)	(3)	3.7	4.8	5.1	6.5	4.6
Tennessee	(4)	7.1	8.9	8.7	8.4	7.4	7.2	6.0	6.2	6.7	7.0
Texas	(3)	(3)	(3)	(3)	(3)	(3)	(3)	7.7	7.3	7.3	6.9
Utah	4.9	7.5	4.9	4.9	4.9	4.2	4.3	4.5	4.5	4.6	4.4
Vermont	6.7	7.3	5.8	7.7	6.6	7.6	7.1	5.7	3.9	6.8	5.0
Virginia	8.0	6.2	7.5	7.1	7.1	7.5	7.1	6.3	6.4	5.6	5.8
Washington	7.5	6.6	7.2	6.2	6.2	6.4	6.0	6.4	4.9	4.9	5.2
West Virginia	7.1	6.2	5.7	5.8	6.0	5.8	5.7	5.7	5.5	5.2	5.3
Wisconsin	6.0	5.3	5.8	5.1	5.4	4.5	4.4	5.0	4.3	4.0	4.2
Wyoming	9.3	8.7	6.5	6.3	9.2	8.4	6.6	5.7	6.1	4.1	5.0

[3] Not added to birth registration area until a later date.

[4] Dropped from the registration area in 1925; readmitted in 1928.

Number of deaths from all puerperal causes and death rates (number per 1,000 live births) in the birth registration area in the United States, 1932–36[1]

Cause of death	Number of deaths					Rate per 1,000 live births				
	1936	1935	1934	1933	1932	1936	1935	1934	1933	1932
The puerperal state	12,183	12,544	12,859	12,885	13,120	5.68	5.82	5.93	6.19	6.32
Abortion with septic conditions	1,801	2,167	2,204	2,037	2,026	.83	1.00	1.01	.97	.97
Abortion without mention of septic condition (to include hemorrhage)	681	602	570	640	706	.31	.27	.26	.30	.34
Ectopic gestation	486	545	571	610	562	.22	.25	.26	.29	.27
With septic condition specified	100	105	106	121	103	.04	.04	.04	.05	.04
Without mention of septic condition	386	440	465	489	459	.17	.20	.21	.23	.22
Other accidents of pregnancy (not to include hemorrhage)	80	84	94	88	84	.03	.03	.04	.04	.04
Puerperal hemorrhage	1,398	1,370	1,404	1,339	1,377	.65	.63	.64	.64	.66
Puerperal septicemia (not specified as due to abortion)	2,705	2,902	2,808	2,729	2,734	1.26	1.34	1.29	1.31	1.31
Puerperal septicemia and pyemia	2,697	2,897	2,800	2,719	2,721	1.25	1.34	1.29	1.30	1.31
Puerperal tetanus	8	5	8	10	13	(2)	(2)	(2)	(2)	(2)
Puerperal albuminuria and eclampsia	2,235	2,229	2,431	2,520	2,659	1.04	1.03	1.12	1.21	1.28
Other toxemias of pregnancy	549	497	559	535	489	.25	.23	.25	.25	.23
Puerperal phlegmasia, alba dolens, embolus, sudden death (not specified as septic)	567	578	561	592	626	.26	.26	.25	.28	.30
Other accidents of childbirth	1,635	1,543	1,621	1,750	1,807	.76	.71	.74	.84	.87
Cesarean operation	409	336	416	389	440	.19	.15	.19	.18	.21
Others under this title	1,226	1,207	1,205	1,361	1,367	.57	.56	.55	.65	.65
Other and unspecified conditions of the puerperal state	46	27	36	45	50	.02	.01	.01	.02	.02

[1] Vital Statistics—Special Report, vol. 5, No. 19, p. 53, Mar. 29, 1938, Bureau of the Census.

[2] Less than 0.01 per 1,000 live births.

PUBLIC HEALTH SERVICE PUBLICATIONS

A List of Publications Issued During the Period July–December 1937

There is printed herewith a list of publications of the United States Public Health Service issued during the period July–December 1937. The most important articles that appear each week in the PUBLIC HEALTH REPORTS are reprinted in pamphlet form, making possible a wider and more economical distribution of information that is of especial value and interest to public health workers and the general public.

All of the publications listed below except those marked with an asterisk (*) are available for free distribution and as long as the supply lasts may be obtained by addressing the Surgeon General, United States Public Health Service, Washington, D. C. Those publications marked with an asterisk are not available for free distribution, but, unless stated to be "out of print," may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., *at the prices noted.* (No remittances should be sent to the Public Health Service.)

Periodicals

*Public Health Reports (weekly), July–December, vol. 52, nos. 27–53, pages 872 to 1965. 5 cents a copy.

*Venereal Disease Information (monthly), July–December, vol. 18, nos. 7–12, pages 223 to 458. 5 cents a copy.

Reprints From the Public Health Reports

1836. Studies on trichinosis. IV. The role of the garbage-fed hog in the production of human trichinosis. By Maurice C. Hall. July 2, 1937. 14 pages.

1837. A low temperature ball mill for the liberation of labile cellular products. By Stuart Mudd, C. H. Shaw, E. J. Czarnetzky, and Earl W. Flosdorf. July 2, 1937. 6 pages.

1838. Spontaneous mammary tumors in mice. Factors influencing the incidence of metastases. By L. L. Ashburn. July 9, 1937. 14 pages.

1839. Experimental studies of natural purification in polluted waters. X. Reoxygenation of polluted waters by microscopic algae. By W. C. Purdy. July 16, 1937. 34 pages.

1840. Some factors which affect the relationship between housing and health. By J. M. DallaValle. July 23, 1937. 10 pages.

1841. Age of gainful white and negro male workers of the United States 1920 and 1930. Studies on the age of gainful workers no. 4. By William M. Gafafer. July 23, 1937. 13 pages.

1842. A study of syphilis in the Coast Guard. By H. McG. Robertson. July 30, 1937. 8 pages.

1843. Recent court decisions on milk control (1934–37). By James A. Tobey. July 30, 1937. 7 pages.

1844. Studies on chronic brucellosis. I. Introduction. By Alice C. Evans. August 6, 1937. 5 pages.

1845. Case records as an index of the public health nurse's work. By Helen Bean and Emily Hankla. August 6, 1937. 12 pages.

1846. Report on market-milk supplies of certain urban communities. Compliance of the market-milk supplies of certain urban communities with the Grade A pasteurized and Grade A raw milk requirements of the Public Health Service milk ordinance and code (as shown by compliance (not safety) ratings of 90 percent or more reported by the State milk-sanitation authorities during the period July 1, 1935, to June 30, 1937). August 6, 1937. 5 pages.

1847. The occurrence in the sera of man and monkeys of protective antibodies against the virus of lymphocytic choriomeningitis as determined by the serum-virus protection test in mice. By Jerald G. Wooley, Charles Armstrong, and Robert H. Onstott. August 13, 1937. 10 pages.

1848. Note on comparative tests made with the Hatch and the Greenburg-Smith impingers. By J. M. DallaValle. August 13, 1937. 4 pages.

1849. Public Health Service publications. A list of publications issued during the period January–June 1937. August 13, 1937. 5 pages.

1850. Experimental meningitis in guinea pigs. By S. E. Branham, R. D. Lillie, and A. M. Pabst. August 20, 1937. 9 pages; 2 plates.

1851. Serum studies in experimental meningitis. Lack of protection for rabbits and guinea pigs. By Sara E. Branham and Anna M. Pabst. August 20, 1937. 8 pages.

1852. The elimination of selenium and its distribution in the tissues. By M. I. Smith, B. B. Westfall, and E. F. Stohlman. August 27, 1937. 6 pages.

1853. Notes on the continuous rearing of Aedes aegypti in the laboratory. By H. A. Johnson. August 27, 1937. 3 pages.

1854. Studies in chemotherapy. VI. The chemotherapy of choriomeningitis virus infection in mice with sulphonamide compounds. By Sanford M. Rosenthal, Jerald G. Wooley, and Hugo Bauer. September 3, 1937. 7 pages.

1855. Toxicology of selenium. IV. Effects of exposure to hydrogen selenide. By H. C. Dudley and John W. Miller. September 3, 1937. 14 pages.

1856. Biological products. Establishments licensed for the propagation and sale of viruses, serums, toxins, and analogous products. September 3, 1937. 6 pages.

1857. Further studies on the minimal threshold of chronic endemic dental fluorosis. By H. Trendley Dean and Elias Elvove. September 10, 1937. 16 pages.

1858. Relationship of a rural health program to the needs in the area. By Joseph W. Mountin, Elliott H. Pennell, and Hazel O'Hara. September 10, 1937. 21 pages.

1859. Disabling illness among industrial employees in 1936 as compared with earlier years. By Dean K. Brundage. September 17, 1937. 7 pages.

1860. Removal of fluoride from water. By Elias Elvove. September 17, 1937. 7 pages.

1861. Note on a new ocular micrometer for use in dust counting. By Richard T. Page. September 17, 1937. 2 pages.

1862. Cultivation of the rickettsiae of Rocky Mountain spotted fever in vitro. By Ida A. Bengtson. September 24, 1937. 7 pages; 4 plates.

1863. Cultivation of the rickettsiae of endemic (murine) and epidemic (European) typhus fever in vitro. By Ida A. Bengtson. September 24, 1937. 5 pages; 4 plates.

1864. Further field studies on the selenium problem in relation to public health. By M. I. Smith and B. B. Westfall. October 1, 1937. 10 pages.

1865. How expenditures for selected public health services are apportioned. By Joseph W. Mountin. October 1, 1937. 6 pages.

1866. The use of a dark adaptation technique (biophotometer) in the measurement of vitamin A deficiency in children. By Carroll E. Palmer and Harold Blumberg. October 8, 1937. 16 pages.

1867. Studies on chronic brucellosis. II. Description of techniques for specific tests. By Alice C. Evans. October 8, 1937. 9 pages; 1 plate.

1868. Dermatitis among a group of office workers found not to be of occupational origin. By Louis Schwartz and Marion B. Sulzberger. October 15, 1937. 7 pages; 1 plate.

1869. Studies on the infection of dogs with trophozoites of Endamoeba histolytica by the oral route. A preliminary report. By John Clyde Swartzwelder. October 15, 1937. 5 pages.

1870. Progress in oyster conditioning. With report of experiments at the demonstration plant, Norfolk, Va. By Richard Messer and George M. Reece. October 15, 1937. 9 pages.

1871. Studies on oxyuriasis. VI. The incidence of oxyuriasis in 1,272 persons in Washington, D. C., with notes on diagnosis. By Eloise B. Cram, Myrna F. Jones, Lucy Reardon, and Mabelle O. Nolan. October 22, 1937. 25 pages.

1872. The association of scurvy with oral diseases. By F. C. Cady. October 29, 1937. 5 pages.

1873. Kentucky's plan for public health education. By A. T. McCormack and Reba F. Harris. October 29, 1937. 5 pages.

1874. General aspects and functions of the sick benefit organization. By R. R. Sayers, Gertrud Kroeger, and W. M. Gafafer. November 5, 1937. 18 pages.

1875. Treatment of psoriasis with massive doses of crystalline vitamin D and irradiated ergosterol. A preliminary report. By E. T. Ceder and Leo Zon. November 5, 1937. 4 pages.

1876. Pulmonary tumors in mice. IV. Lung tumors induced by subcutaneous injection of 1:2:5:6-dibenzanthracene in different media and by its direct contact with lung tissues. By H. B. Andervont. November 5, 1937. 6 pages; 3 plates.

1877. State and insular health authorities, 1937. Directory, with data as to appropriations and publications. November 12, 1937. 20 pages.

1878. Protracted incubation in malarial fever. Report of a case and a review of the literature. By Bruce Mayne. November 12, 1937. 9 pages.

1879. Extent of rural health service in the United States, December 31, 1932, to December 31, 1936. November 19, 1937. 28 pages.

1880. Directory of whole-time county health officers, 1937. November 19, 1937. 14 pages.

1881. Immunizing properties of formolized Rocky Mountain spotted fever rickettsiae cultivated in modified Maitland media. By Ida A. Bengtson. November 26, 1937. 6 pages.

1882. Methods for the determination of quartz in industrial dusts. By F. H. Goldman. November 26, 1937. 11 pages.

1883. A study of dust control methods in an asbestos fabricating plant. By Richard T. Page and J. J. Bloomfield. November 26, 1937. 15 pages; 3 plates.

1884. The increase in average length of life. By Harold F. Dorn. December 3, 1937. 25 pages.

1885. An approach to a rural mental health problem. By J. Allen Jackson. December 3, 1937. 6 pages.

1886. Health supervision by nurses in a bicounty health department. Brunswick-Greensville health administration studies no. 9. By Rosalie I. Peterson. December 3, 1937. 11 pages.
1887. Seasonal variation in intensity of brain reaction of the St. Louis encephalitis in mice and of endemic typhus in guinea pigs. By R. D. Lillie, R. E. Dyer, C. Armstong, and J. G. Pasternack. December 10, 1937. 18 pages.
1888. City health officers, 1937. Directory of those in cities of 10,000 or more population. December 10, 1937. 18 pages.
1889. Medical activities at the Boy Scout Jamboree held in Washington, D. C., June 30–July 9, 1937. By W. L. Smith. December 17, 1937. 11 pages; 3 plates.
1890. Effect of addition of dithioethylamine (cystine amine) to the diet of the albino rat. By W. H. Sebrell, R. H. Onstott, D. J. Hunt, and R. D. Lillie. December 24, 1937. 8 pages; 7 plates.
1891. The use of pure strain animals in studies on natural resistance to transplantable tumors. By H. B. Andervont. December 24, 1937. 11 pages.
1892. Mortality from rheumatic heart disease in Philadelphia during 1936. By O. F. Hedley. December 31, 1937. 17 pages.
1893. The family as a unit for nursing service. By Helen Bean and Georgie S. Brockett. December 31, 1937. 8 pages.
1894. Dibenzanthracene tumors in mice. The production of subcutaneous and pulmonary tumors by 1:2:5:6-dibenzanthracene adsorbed on charcoal. By H. B. Andervont and Egon Lorenz. December 31, 1937. 9 pages.

Supplements to the Public Health Reports

127. Suggestibility in delinquent and nondelinquent adult white males. By Victor H. Vogel. 1937. 10 pages; 1 plate.
128. Clinical studies of drug addiction. III. A critical review of the withdrawal treatments with method of evaluating abstinence syndromes. By Lawrence Kolb and C. K. Himmelsbach. 1938. 33 pages.
129. The bedbug. Its relation to public health, its habits and life history, and methods of control. By Maurice C. Hall. 1937. 7 pages.
130. Some Public Health Service publications suitable for general distribution. 1937. 22 pages.
131. The rat and ratproof construction of buildings. With specifications, drawings, and photographs and a model ratproofing ordinance. By B. E. Holsendorf. Drawings by P. W. Clark. 1937. 68 pages; 31 plates.
132. Clinical studies of drug addiction. IV. Suggestibility in narcotic addicts. By Victor H. Vogel. 1937. 7 pages.
133. Public health nursing. Prepared by Pearl McIver. 1937. 14 pages.

Public Health Bulletins

237. Illness and medical care in Puerto Rico. By Joseph W. Mountin, Elliott H. Pennell, and Evelyn Flook. June 1937. 63 pages; 16 plates.
238. Occupational and environmental analysis of the cement, clay, and pottery industries. By R. R. Sayers, J. M. DallaValle, and S. G. Bloomfield. September 1937. 50 pages.
239. Dental caries in American Indian children. By Henry Klein and Carroll E. Palmer. December 1937. 54 pages.

National Institute of Health Bulletin

169. Standardization of antipneumococcus horse sera and concentrates. By Lloyd D. Felton and H. J. Stahl. February 1937. 58 pages.

Unnumbered Publications

Index to Public Health Reports, vol. 52, part 1 (January–June 1937). 1937. 26 pages.

Venereal Disease Bulletins

59. The wonderful story of life. A parent's talks with children regarding life and its reproduction. (Revised edition, 1937.) 19 pages.
91. Syphilis: Its cause, its spread, its cure. 8 pages.
92. Gonorrhea: Its cause, its spread, its cure. 7 pages.

Reprints From Venereal Disease Information

70. Control of syphilis. By Thomas Parran. Vol. 18, July 1937. 7 pages.
71. A tentative death curve for acquired syphilis in white and colored males in the United States. By Lida J. Usilton and John Rice Miner. Vol. 18, July 1937. 9 pages.
72. Serodiagnostic tests for syphilis in 39 State laboratories. By Thomas Parran, H. H. Hazen, J. F. Mahoney, Arthur H. Sanford, F. E. Senear, Walter M. Simpson, and R. A. Vonderlehr. Vol. 18, August 1937. 7 pages.
73. Teaching of venereal disease control in medical schools. By Paul A. O'Leary. Vol. 18, September 1937. 5 pages.
74. The principles of case finding. By Julia MacPhillips. Vol. 18, September 1937. 4 pages.
75. A traveling clinic. Vol. 18, October 1937. 1 page; 2 plates.
76. Citizen support in syphilis control. By Homer Folks. Vol. 18, October 1937. 6 pages.
77. Creating and maintaining the interest of social workers in a program for the control of gonorrhea and syphilis. By Gladys L. Crain. Vol. 18, November 1937. 9 pages.

Supplements to Venereal Disease Information

4. Hospitals and Dispensaries for the Treatment of Venereal Diseases. 29 pages.

DEATHS DURING WEEK ENDED APR. 2, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Apr. 2, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	8,456	9,381
Average for 3 prior years	9,369	
Total deaths, first 13 weeks of year	115,810	132,771
Deaths under 1 year of age	565	591
Average for 3 prior years	616	
Deaths under 1 year of age, first 13 weeks of year	7,072	8,176
Data from industrial insurance companies:		
Policies in force	69,691,451	69,614,527
Number of death claims	13,370	15,923
Death claims per 1,000 policies in force, annual rate	10.0	11.9
Death claims per 1,000 policies, first 13 weeks of year, annual rate	10.1	11.5

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (------) indicate that cases or deaths may have occurred although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Apr. 9, 1938, and Apr. 10, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Apr. 9, 1938	Week ended Apr. 10, 1937	Week ended Apr. 9, 1938	Week ended Apr. 10, 1937	Week ended Apr. 9, 1938	Week ended Apr. 10, 1937	Week ended Apr. 9, 1938	Week ended Apr. 10, 1937
New England States:								
Maine	3	1	6	3	276	4	0	1
New Hampshire	0	0	------	------	29	113	0	0
Vermont	0	0	------	------	94	------	0	0
Massachusetts	1	8	------	------	283	736	0	8
Rhode Island	0	0	------	------	1	232	0	1
Connecticut	5	4	5	12	28	799	3	2
Middle Atlantic States:								
New York	33	31	[1] 13	[1] 26	3,059	1,020	3	10
New Jersey	17	7	13	13	1,577	3,300	0	5
Pennsylvania	40	37	------	------	6,032	601	5	13
East North Central States:								
Ohio	14	13	------	21	2,553	270	4	2
Indiana	21	4	5	110	1,181	137	2	5
Illinois	22	46	10	105	3,781	85	2	1
Michigan [2]	10	18	2	------	4,336	97	0	2
Wisconsin	0	4	22	40	2,958	19	1	2
West North Central States:								
Minnesota	4	14	2	1	227	22	0	1
Iowa	2	1	8	------	194	8	1	0
Missouri	23	41	21	111	663	55	1	1
North Dakota	0	1	39	24	76	1	1	0
South Dakota	0	0	------	------	------	2	0	0
Nebraska	1	1	27	------	127	12	0	1
Kansas	6	5	6	4	513	26	1	4
South Atlantic States:								
Delaware	0	3	------	5	25	39	0	2
Maryland [2]	8	15	16	12	115	872	0	5
District of Columbia	3	4	1	1	17	116	0	2
Virginia	9	13	------	------	438	248	2	9
West Virginia	10	5	58	110	600	19	3	7
North Carolina [3]	13	17	3	61	2,390	204	1	4
South Carolina	3	2	170	528	241	39	0	0
Georgia [3]	4	9	------	344	406	------	0	2
Florida [3]	15	7	2	21	603	17	4	1

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Apr. 9, 1938, and Apr. 10, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Apr. 9, 1938	Week ended Apr. 10, 1937	Week ended Apr. 9, 1938	Week ended Apr. 10, 1937	Week ended Apr. 9, 1938	Week ended Apr. 10, 1937	Week ended Apr. 9, 1938	Week ended Apr. 10, 1937
East South Central States:								
Kentucky	14	11	5	21	674	448	6	12
Tennessee	5	7	55	141	417	53	5	7
Alabama [3]	5	10	45	648	961	9	7	10
Mississippi [2]	8	4					0	1
West South Central States:								
Arkansas	8	1	55	82	493	1	1	0
Louisiana [3]	5	7	9	54	7	6	2	1
Oklahoma [4]	8	16	74	115	112	55	1	2
Texas [3]	22	43	360	792	436	668	3	2
Mountain States:								
Montana	0	0		11	20	39	0	1
Idaho [5]	1	1	2	10	10	15	1	1
Wyoming [5]	0	1			46	3	0	0
Colorado	2	5			166	11	0	1
New Mexico	0	0	1	4	96	81	0	0
Arizona	2	0	92	38	32	238	1	3
Utah [2]	6	2			360	33	0	0
Pacific States:								
Washington	5	3	1		9	46	1	1
Oregon [6]	7	0	42	34	38	4	1	1
California	30	28	50	417	616	138	2	5
Total	395	444	1,220	3,931	37,319	11,001	65	139
First 14 weeks of year	8,149	7,218	36,040	259,592	451,906	92,723	1,226	2,347

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended Apr. 9, 1938	Week ended Apr. 10, 1937	Week ended Apr. 9, 1938	Week ended Apr. 10, 1937	Week ended Apr. 9, 1938	Week ended Apr. 10, 1937	Week ended Apr. 9, 1938	Week ended Apr. 10, 1937	Week ended Apr. 9, 1938
New England States:									
Maine	0	0	22	15	0	0	3	2	69
New Hampshire	0	0	24	13	0	0	0	0	1
Vermont	0	0	18	2	0	0	0	0	30
Massachusetts	0	0	405	274	0	0	0	1	105
Rhode Island	0	0	29	76	0	0	0	2	22
Connecticut	0	0	139	162	0	0	1	0	64
Middle Atlantic States:									
New York	4	2	1,036	898	0	0	5	5	458
New Jersey	0	0	163	174	0	0	5	1	158
Pennsylvania	0	0	602	598	0	0	11	7	296
East North Central States:									
Ohio	0	0	273	245	3	3	4	4	75
Indiana	0	0	124	234	74	9	6	0	12
Illinois	0	0	527	763	47	23	4	2	91
Michigan [2]	0	2	465	712	9	17	4	0	257
Wisconsin	0	0	139	351	2	4	0	0	131
West North Central States:									
Minnesota	0	0	144	166	15	5	3	0	15
Iowa	0	0	246	295	50	53	1	0	20
Missouri	1	0	227	519	33	73	5	0	97
North Dakota	0	0	17	30	3	15	0	0	4
South Dakota	0	0	9	97	16	6	0	0	19
Nebraska	0	0	19	88	6	5	0	0	13
Kansas	0	0	142	355	18	20	1	1	92
South Atlantic States:									
Delaware	0	0	9	3	0	0	1	2	9
Maryland [2]	0	0	62	43	0	0	8	0	59
District of Columbia	0	0	23	11	0	0	1	1	12
Virginia	0	0	33	14	0	2	2	10	43

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Apr. 9, 1938, and Apr. 10, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended Apr. 9, 1938	Week ended Apr. 10, 1937	Week ended Apr. 9, 1938	Week ended Apr. 10, 1937	Week ended Apr. 9, 1938	Week ended Apr. 10, 1937	Week ended Apr. 9, 1938	Week ended Apr. 10, 1937	Week ended Apr. 9, 1938
South Atlantic States—Con.									
West Virginia	0	1	49	56	0	0	1	3	63
North Carolina [3]	0	1	27	45	0	0	1	2	298
South Carolina	0	2	6	6	0	0	0	1	51
Georgia [3]	1	0	3	12	0	0	3	0	25
Florida [3]	0	0	8	18	0	0	3	2	25
East South Central States:									
Kentucky	2	0	69	58	8	2	0	11	28
Tennessee	0	0	30	35	2	0	3	6	42
Alabama [3]	0	1	9	15	1	0	4	3	65
Mississippi [2]	1	1	2	7	1	0	2	0	
West South Central States:									
Arkansas	0	0	4	12	9	2	4	3	69
Louisiana [3]	1	0	9	14	1	1	9	11	19
Oklahoma [4]	1	0	13	33	13	3	1	1	182
Texas [3]	2	0	116	110	39	1	25	16	263
Mountain States:									
Montana	0	0	16	17	8	36	1	3	53
Idaho [5]	0	0	10	20	4	1	0	0	11
Wyoming [5]	0	0	17	17	5	8	0	0	25
Colorado	0	0	38	34	1	5	3	0	12
New Mexico	0	1	15	19	0	0	0	4	19
Arizona	0	0	8	23	1	0	0	1	61
Utah [2]	0	1	47	18	2	0	0	0	30
Pacific States:									
Washington	0	1	37	36	36	21	0	0	113
Oregon [5]	0	0	65	53	20	17	1	1	25
California	1	4	208	196	48	19	7	2	515
Total	14	17	5,703	6,992	475	351	128	108	4,155
First 14 weeks of year	293	294	85,084	95,374	7,639	4,333	1,694	1,514	58,168

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[1] New York City only

[2] Period ended earlier than Saturday.

[3] Typhus fever, week ended Apr. 9. 1938, 20 cases, as follows: North Carolina, 1; Georgia, 5; Florida, 4; Alabama, 4; Louisiana, 1; Texas, 5.

[4] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

[5] Rocky Mountain spotted fever, week ended Apr. 9, 1938, 3 cases as follows: Idaho, 1; Wyoming, 1; Oregon, 1.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
February 1938										
Alaska	6		29		1		0	4		0
March 1938										
Connecticut	1	29	27		110		0	520	0	1
Delaware	0	6			125		0	193	0	1
District of Columbia	2	47	8		53		0	102	0	0
North Carolina	9	99	78	33	13,938	22	6	179	5	7
West Virginia	14	38	160		2,188			258	0	10
Wyoming	2	3			132		0	99	3	1

Summary of monthly reports from States—Continued

February 1938	Cases
Alaska:	
Chickenpox	27
Impetigo contagiosa	2
Mumps	105
Septic sore throat	3
Whooping cough	9
March 1938	
Chickenpox:	
Connecticut	870
Delaware	75
District of Columbia	304
North Carolina	1,433
West Virginia	222
Wyoming	123
Conjunctivitis, infectious:	
Connecticut	2
Encephalitis, epidemic or lethargic:	
Connecticut	2
West Virginia	2

March, 1938—Continued	Cases
German measles:	
Connecticut	27
Delaware	1
North Carolina	47
Wyoming	7
Hookworm disease:	
Connecticut	1
Lead poisoning:	
Connecticut	1
Mumps:	
Connecticut	1,419
Delaware	213
West Virginia	7
Wyoming	50
Ophthalmia neonatorum:	
Connecticut	1
North Carolina	2
Paratyphoid fever:	
Connecticut	2
North Carolina	1

March, 1938—Continued	Cases
Rabies in animals:	
Connecticut	2
Septic sore throat:	
Connecticut	30
North Carolina	9
Wyoming	3
Trichinosis:	
Connecticut	2
Typhus fever:	
North Carolina	4
Undulant fever:	
Connecticut	10
Delaware	1
West Virginia	2
Whooping cough:	
Connecticut	274
Delaware	30
District of Columbia	34
North Carolina	2,074
West Virginia	215
Wyoming	91

PLAGUE INFECTION IN ADAMS AND LINCOLN COUNTIES, WASH.

Under date of April 11 plague infection was reported proved, by animal inoculation, in 2 lots of fleas, as follows: 1 lot of 252 fleas taken from 24 ground squirrels, *Citellus townsendii*, shot on March 30, 1938, 2 miles southeast of Lind, Adams County, Wash., and the other a lot of 94 fleas from 11 squirrels of the same species shot on the same day on the east side of the town limits of Lind.

On April 14 plague infection was reported proved, by mass inoculation, in tissue from two ground squirrels, *Citellus townsendii*, taken April 6, 1938, in Lincoln County, Wash., 13 miles north of Ritzville.

WEEKLY REPORTS FROM CITIES

City reports for week ended Apr. 2, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	189	386	101	7,213	881	2,639	26	407	21	1,414	--------
Current week	102	129	47	13,769	711	1,919	24	377	18	1,284	--------
Maine:											
Portland	0	1	0	12	2	1	0	0	1	35	24
New Hampshire:											
Concord	0	------	0	0	0	0	0	0	0	0	3
Manchester	0	------	0	0	5	12	0	0	0	0	27
Nashua	0	------	0	0	1	0	0	1	0	0	14
Vermont:											
Barre	0	------	0	23	0	2	0	1	0	0	3
Burlington	0	------	0	8	0	2	0	0	0	0	12
Rutland	0	------	0	0	0	0	0	0	0	0	5
Massachusetts:											
Boston	0	------	1	225	39	136	0	11	1	31	226
Fall River	0	------	0	3	2	0	0	2	0	1	37
Springfield	0	------	0	10	4	3	0	1	0	13	22
Worcester	0	------	0	1	5	13	0	1	0	2	41
Rhode Island:											
Pawtucket	0	------	0	0	0	6	0	0	0	0	10
Providence [1]	[1] 0	------	0	0	5	[1] 17	0	4	0	30	66
Connecticut:											
Bridgeport	0	------	0	2	2	31	0	1	0	0	39
Hartford	0	------	0	0	8	31	0	1	0	2	46
New Haven	0	------	0	6	2	2	0	1	0	20	37
New York:											
Buffalo	0	------	1	2	11	70	0	5	0	9	161
New York	19	13	7	1,836	152	413	0	90	3	213	1,529
Rochester	0	3	0	8	6	28	0	5	0	4	75
Syracuse	1	------	0	24	5	10	0	2	0	12	45
New Jersey:											
Camden	0	------	0	56	6	3	0	0	0	5	28
Newark	0	------	0	14	15	9	0	6	0	37	111
Trenton	0	1	0	0	4	0	0	1	0	0	32
Pennsylvania:											
Philadelphia	1	------	2	970	39	133	0	15	0	52	478
Pittsburgh	2	5	3	158	17	41	0	10	0	14	166
Reading	0	------	1	13	3	4	0	1	0	3	20
Scranton	1	------	--------	73	-------	8	0	-------	0	0	--------
Ohio:											
Cincinnati	5	3	3	6	13	14	0	12	0	7	132
Cleveland	0	14	0	450	26	67	0	12	0	71	203
Columbus	2	------	0	472	1	4	10	0	0	4	77
Toledo	0	------	0	168	4	13	0	1	0	8	77
Indiana:											
Anderson	0	------	0	128	2	2	0	0	0	0	12
Fort Wayne	0	------	1	113	3	5	0	0	0	1	27
Indianapolis	1	------	0	310	10	25	1	1	0	3	102
Muncie	0	------	0	10	2	0	28	0	0	0	16
South Bend	0	------	0	23	1	2	0	0	0	4	11
Terre Haute	0	------	0	23	0	3	0	0	0	0	21
Illinois:											
Alton	0	------	0	0	0	1	0	0	0	0	12
Chicago	14	3	3	2,452	44	232	0	44	0	49	657
Elgin	0	------	0	1	1	6	0	0	0	2	7
Moline	0	------	0	39	0	6	0	0	0	0	7
Springfield	0	1	0	218	2	3	0	0	0	0	22
Michigan:											
Detroit	2	2	4	2,382	21	178	0	16	0	84	220
Flint	2	------	0	35	3	58	0	1	0	18	32
Grand Rapids	0	------	0	119	3	12	0	1	0	2	27

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[1] The report of 20 cases of diphtheria in Providence, R. I., during the week ended March 12, 1938 (Public Health Reports, April 1, p. 512), was an error. These were cases of scarlet fever. Dr. M. J. Nestor, in writing to correct his report, states that "Providence is proud of its record of no case of diphtheria since November 6, 1937."

City reports for week ended Apr. 2, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Wisconsin:											
Kenosha	0	------	0	96	0	8	0	0	0	0	4
Madison	0	------	0	47	1	3	0	0	0	13	18
Milwaukee	2	1	1	1,226	4	14	0	4	0	57	97
Racine	0	------	0	229	1	7	0	1	0	24	12
Superior	0	------	0	11	0	0	0	0	0	0	6
Minnesota:											
Duluth	0	------	0	5	2	2	0	1	2	8	16
Minneapolis	1	------	0	134	6	27	0	0	0	1	90
St. Paul	1	------	0	1	6	7	2	0	0	0	57
Iowa:											
Cedar Rapids	0	------	------	2	------	4	1	------	1	4	------
Davenport	0	------	------	2	------	4	0	------	0	0	------
Des Moines	0	------	0	21	0	25	4	0	0	0	28
Sioux City	0	------	------	0	------	10	0	------	0	5	------
Waterloo	1	------	------	113	------	2	0	------	0	0	------
Missouri:											
Kansas City	0	------	0	119	6	14	0	5	0	0	89
St. Joseph	0	------	0	35	4	1	0	1	0	0	23
St. Louis	9	1	0	16	12	79	3	4	0	4	234
North Dakota:											
Fargo	0	------	0	0	0	0	0	0	0	4	3
Grand Forks	0	------	------	52	------	0	0	------	0	0	------
Minot	0	------	0	0	0	0	0	0	0	0	2
South Dakota:											
Aberdeen	0	------	------	0	------	1	0	------	0	8	------
Sioux Falls	0	------	0	0	0	0	0	0	0	0	10
Nebraska:											
Omaha	0	------	0	57	13	0	0	0	0	0	71
Kansas:											
Lawrence	0	1	1	0	3	0	0	0	1	1	12
Topeka	0	------	1	75	2	4	0	0	0	15	17
Wichita	0	1	1	6	10	5	0	0	0	1	31
Delaware:											
Wilmington	0	------	0	10	5	3	0	0	0	3	18
Maryland:											
Baltimore	2	5	1	19	22	36	0	11	0	49	229
Cumberland	0	------	0	3	1	3	0	0	0	0	14
Frederick	0	------	0	0	1	1	0	0	0	0	2
District of Columbia.											
Washington	5	3	1	17	14	18	0	9	0	14	162
Virginia:											
Lynchburg	1	------	0	1	1	0	0	0	0	2	11
Norfolk	0	3	0	54	3	8	0	1	2	17	26
Richmond	0	------	0	121	2	4	0	4	1	0	58
Roanoke	2	------	0	0	1	2	0	2	2	8	16
West Virginia:											
Charleston	0	------	0	7	2	0	0	0	0	0	11
Huntington	1	------	------	2	------	0	0	------	0	0	------
Wheeling	0	------	0	216	1	1	0	0	0	12	24
North Carolina:											
Gastonia	0	------	------	37	------	0	0	------	0	10	------
Raleigh	0	------	0	138	5	0	0	0	0	7	18
Wilmington	0	------	0	190	1	1	0	0	0	21	13
Winston-Salem	0	------	0	17	2	2	0	0	1	36	14
South Carolina:											
Charleston	0	30	0	17	3	0	0	1	1	1	20
Florence	0	------	0	10	2	0	0	0	0	0	13
Greenville	0	------	------	0	------	0	0	0	0	6	------
Georgia:											
Atlanta	1	6	1	44	9	2	0	8	0	4	70
Brunswick	0	------	0	4	1	0	0	0	0	0	4
Savannah	0	5	0	136	1	0	0	1	0	1	27
Florida:											
Miami	3	103	1	1	0	0	0	3	2	0	40
Tampa	4	1	1	12	2	1	0	1	0	1	21
Kentucky:											
Ashland	0	------	0	2	8	0	0	0	1	2	21
Lexington	0	------	0	0	2	1	0	1	0	5	21
Louisville	7	6	2	298	7	51	0	4	1	17	78
Tennessee:											
Knoxville	1	------	1	53	2	1	0	1	0	0	31
Memphis	0	------	1	17	8	2	1	7	0	0	76
Nashville	0	------	1	74	6	5	0	1	0	9	43

City reports for week ended Apr. 2, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Alabama:											
Birmingham	0	8	0	55	4	0	0	6	0	0	50
Mobile	0	------	2	26	1	0	0	2	0	0	27
Montgomery	0	------	------	78	------	0	0	------	1	0	------
Arkansas:											
Fort Smith	0	------	------	2	------	0	0	------	0	1	------
Little Rock	0	------	0	28	5	0	0	0	0	2	5
Louisiana:											
Lake Charles	1	------	0	0	1	0	0	0	0	0	4
New Orleans	8	3	3	1	11	1	0	11	5	21	134
Shreveport	0	------	0	3	6	3	0	5	0	0	40
Oklahoma:											
Muskogee	0	------	------	0	------	1	0	------	0	3	------
Oklahoma City	0	------	0	2	6	1	0	2	0	0	47
Tulsa	0	------	------	63	------	3	2	------	0	0	------
Texas:											
Dallas	1	------	0	3	9	11	0	3	0	6	71
Fort Worth	0	------	0	0	4	3	0	3	0	1	36
Galveston	0	------	0	0	2	0	0	0	0	0	17
Houston	1	------	1	2	7	2	2	10	1	0	95
San Antonio	1	------	1	0	5	0	0	5	0	4	62
Montana:											
Billings	0	------	0	0	1	0	0	0	0	1	5
Great Falls	0	------	0	1	1	1	1	0	0	10	3
Helena	0	------	0	1	0	0	0	0	0	3	5
Missoula	0	------	0	0	0	1	0	0	0	0	4
Idaho:											
Boise	0	------	0	0	1	1	1	0	0	0	4
Colorado:											
Colorado Springs	0	------	0	0	1	0	3	3	0	0	13
Denver	3	------	1	310	8	21	0	4	0	2	89
Pueblo	0	------	0	1	3	1	0	1	0	5	21
New Mexico:											
Albuquerque	0	------	0	3	0	0	0	1	0	1	10
Utah:											
Salt Lake City	0	------	0	205	1	7	0	1	0	14	26
Washington:											
Seattle	0	------	0	0	3	3	1	2	0	65	104
Spokane	0	1	1	2	6	4	0	0	0	20	42
Tacoma	0	------	0	0	5	7	2	0	0	5	38
Oregon:											
Portland	0	1	0	9	7	26	3	4	1	0	87
Salem	0	2	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	11	13	1	16	13	37	0	14	0	29	344
Sacramento	0	3	2	2	2	2	0	2	0	30	32
San Francisco	0	2	0	4	9	18	0	5	0	51	191

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Vermont:			
Barre	0	0	1
Massachusetts:			
Boston	2	0	0
Connecticut:			
New Haven	3	0	0
New York:			
Buffalo	0	2	0
New York	6	2	0
Ohio:			
Cincinnati	1	1	0
Cleveland	1	0	0
Illinois:			
Chicago	1	0	0
Maryland:			
Baltimore	1	0	0
Kentucky:			
Louisville	1	0	0
Tennessee:			
Knoxville	1	0	0
Louisiana:			
New Orleans	4	0	0
Texas:			
Dallas	0	0	1
Houston	2	0	1
California:			
Los Angeles	3	1	0

Encephalitis, epidemic or lethargic.—Cases: New York 4; Pittsburgh, 1; Milwaukee, 3; Kansas City, Mo., 2; New Orleans, 2; Oklahoma City, 1.

Pellagra.—Cases: Charleston, S. C., 1; Atlanta, 5; Savannah, 9; Dallas, 2; San Francisco, 1; Birmingham, 1.

Typhus fever.—Cases: Atlanta, 1; Houston, 1; Miami, 1.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—2 weeks ended March 12, 1938.—During the 2 weeks ended March 12, 1938, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia[1]	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis			1		4					5
Chickenpox		8	19	390	543	113	69	11	298	1,451
Diphtheria		17	2	68	19	3	6		2	117
Dysentery					1					1
Erysipelas				12	6	2		3	2	25
Influenza		14		25	32	1	12		48	132
Lethargic encephalitis					1					1
Measles	1	51	43	248	806	14	3	66	171	1,403
Mumps		25	11		375	304	7	25	53	800
Paratyphoid fever		1			1				1	3
Pneumonia		16			83		7		27	133
Poliomyelitis		1			1					2
Scarlet fever		43	5	194	243	60	56	81	84	766
Smallpox		1								1
Trachoma									4	4
Tuberculosis	3	22	20	109	113	6	1	2	38	314
Typhoid fever	3		2	20	9		1	[2] 2	1	38
Undulant fever					5				1	6
Whooping cough				175	226	35	3		77	516

[1] 2 weeks ended Mar. 16, 1938.

[2] Suspected.

CUBA

Provinces—Notifiable diseases—4 weeks ended March 5, 1938.—During the 4 weeks ended March 5, 1938, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	1	2	3	3		6	15
Chickenpox	1	14	2	1	7		25
Diphtheria	1	25	1	4	1		32
Dysentery (bacillary)				1			1
Hookworm disease		1					1
Leprosy		3				7	10
Malaria	16	11	9	38	16	63	153
Measles	3	12	9	3			27
Poliomyelitis		1		1		2	4
Scarlet fever		3					3
Tuberculosis	40	33	26	39	15	36	189
Typhoid fever	9	126	4	31	3	46	219
Whooping cough				1			1
Yaws						7	7

CZECHOSLOVAKIA

Communicable diseases—December 1937.—During the month of December 1937, certain communicable diseases were reported in Czechoslovakia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	5	1	Malaria	49	
Cerebrospinal meningitis	16	5	Paratyphoid fever	4	
Chickenpox	308		Poliomyelitis	12	1
Diphtheria	4, 907	214	Puerperal fever	27	8
Dysentery	51	12	Scarlet fever	2, 555	25
Influenza	1, 964	2	Trachoma	70	
Lethargic encephalitis	1		Typhoid fever	559	62

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for March 25, 1938, pages 470–483. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

India—Delhi.—During the week ended April 2, 1938, 1 case of cholera was reported in Delhi, India.

Indochina (French).—During the week ended April 2, 1938, 88 cases of cholera were reported in Tonkin Province, and 58 cases of the same disease were reported in Hanoi, French Indochina.

Plague

Bolivia.—Plague has been reported in Bolivia as follows: Chuquisaca Department, Tomina, February 21–28, 1938, 35 cases. Tarija Department, February 7–20, 1938, 3 cases. Santa Cruz Department, February 14–20, 1938, 1 case of pneumonic plague.

Egypt—Asyut Province—Mellaoui District.—During the week ended April 9, 1938, 1 case of pneumonic plague was reported in Mellaoui District, Asyut Province, Egypt.

Hawaii Territory—Island of Hawaii—Hamakua District.—A rat found on March 9, and one rat found on April 1, 1938, in Paauhau Sector, and one rat found on March 29, and another rat found on March 30, 1938, in Kukaiau, all in Hamakua District, Island of Hawaii, Hawaii Territory, have been proved positive for plague.

United States—Washington.—A report of plague infection in fleas and ground squirrels in Adams and Lincoln Counties, Wash., appears on page 638 of this issue of the PUBLIC HEALTH REPORTS.

Smallpox

Great Britain—England and Wales.—During the week ended March 26, 1938, 1 case of smallpox was reported in Kent County, and 1 case of smallpox was reported in the Port of London, England.

Typhus Fever

Bolivia.—During the period January 3 to February 28, 1938, typhus fever was reported in Bolivia as follows: La Paz, La Paz Department, 18 cases; Oruro, Oruro Department, 9 cases; Potosi, Potosi Department, 5 cases.

Yellow Fever

Brazil.—Yellow fever has been reported in Brazil as follows: Minas Geraes State, February 28 to March 12, 1938, 18 deaths; Rio de Janeiro State, February 21 to March 14, 1938, 7 deaths; Santa Catharina State, March 2, 1938, 1 death; Sao Paulo State, December 28, 1937, 1 death, January 14 to February 17, 1938, 4 cases, and 1 death.

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IN THIS ISSUE

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Trichinosis Incidence Based on Examination of Diaphragms

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PUBLIC HEALTH REPORTS

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SERUMS, ANTITOXIN, AND DRUGS IN THE TREATMENT OF MENINGOCOCCUS MENINGITIS[1]

By SARA E. BRANHAM, *Senior Bacteriologist, United States Public Health Service, National Institute of Health*

Serum therapy in meningococcus meningitis had its beginning with Jochman in 1906 (*1*). He immunized horses and treated 30 human cases of meningitis with their serum. Results were so encouraging that he expressed the belief that serum might prove a useful means of combating the disease.

In 1913, Flexner (*2*) reported the treatment of 1,300 cases with serum with a mortality less than half as great as that prevalent during that period. The importance of the serum being polyvalent was stressed by Dopter (*3*) and by Wollstein (*4*), who had found that meningococci were not all alike serologically.

The importance of polyvalency was emphasized further by the intensive work done during the World War, when meningococcus meningitis was so prevalent in the army camps of France, England, and the United States. Out of this work grew classifications of meningococci into two broad, main groups. The French (*5*) referred to these as A and B; the British as I and II (*6*). Then Gordon and Murray (*7*) subdivided these two groups, by absorption of agglutinins, into I, II, III, and IV. The Gordon-Murray classification has come into use in practically all English-speaking countries, while the French A and B classification is more commonly used on the continent of Europe. No confusion need arise if it be remembered that the French A represents the Gordon-Murray I and III, and that B represents II. Too little is known of IV to be sure of its relationship, though it is apparently quite distinct in this country.

It was during the World War period that the value of antitoxic as well as antibacterial properties in serum was emphasized by Gordon (*8*).

From 1918 to 1928 there was relatively little meningitis; cases were mostly sporadic. There was a general feeling that serum therapy was on a satisfactory basis.

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[1] Read before the Medical Society of the District of Columbia, November 10, 1937.

In 1928, a severe wave of meningococcus meningitis appeared on the West Coast of the United States and moved slowly eastward. Evidence indicated that this wave had its origin in China and that it reached the United States by way of the Philippine Islands. In these outbreaks, serum proved disappointing; mortality remained high; and many physicians felt that serum did no good at all.

To what could be attributed this apparent failure of a method of therapy which had once seemed so promising? In order to find an answer to this question it seemed imperative to find a more satisfactory way of evaluating serum before it was released for distribution. "What constitutes a good serum?" is a question that can be answered only when a good serum can be recognized as such before the therapeutic test is made.

Efforts to determine the value of serum had been made from the very beginning of its use. Jochman (*1*) protected small laboratory animals before he gave serum to human cases. Flexner and Jobling (*9*) did likewise. A general impression developed among workers in this field that laboratory animals, other than the monkey, were not susceptible to infection with meningococci, that death among them was due to endotoxins which gave irregular results, and that, in consequence, a protection test for standardizing serum was not feasible. Bacteriological knowledge has developed rapidly within the last few years, and modern aids to technical skill have made many things easy that were formerly difficult. We know now that very virulent meningococci may often lose their virulence within a few days after isolation, and that stock cultures kept in laboratories may lose specificity and antigenicity as well. These factors were all involved in complicating the problem of satisfactory standardization of antimeningococcic serum upon a protection basis. It was largely due to this situation that the mouse protection test, worked out by Hitchens and Robinson (*10*) in 1916, was not more successful in other hands.

Thus test-tube methods came into use. The agglutination test became generally adopted. Such a standard is arbitrary, but it has served a two-fold purpose: (1) It indicates that the horses responded to injection by producing some kind of antibodies, and (2) it shows polyvalency. Evidently there are other factors involved, and such a test does not tell enough.

During the last decade it has been shown (*11*) that meningococcus infection can be produced in several types of small laboratory animals if cultures of sufficient virulence are used. Intracisternal injection of rabbits and guinea pigs with relatively small doses of very virulent meningococci is followed by a typical acute meningitis. It has been impossible to protect these animals (*12*), because horse serum is very toxic for them when it is given by the intracisternal route and it has thus far proved ineffective by other routes. With mice, however, intraperitoneal injection is followed by a generalized infection (*13*), and they can be protected against such infection by immune serum. Different lots of serum vary widely in protective action, though the agglutinin content of all may be high.

Virulence in meningococci is transient, so that a frequent change in cultures used in such protection studies has been necessary. Recently, Miller has found that suspending meningococci in a solution of mucin (*14*) emphasizes any virulence which such a culture may possess, so that, with very virulent strains, as few as 2 to 10 meningococci may produce a fatal infection. This technique makes it possible to use a given culture over a long period of time and increases the possibility of standardizing such a method sufficiently to make possible its use in evaluating sera. Such a small m. f. d. makes a more accurate titration of serum possible. With so many variable factors—i. e., mice, virulence of culture, lot of mucin, and variation in serum—reliable standardization of such a protection test is not easy; but until that is done, it is impossible for a comparison of results obtained in different laboratories to be accurate. Nevertheless, the fact that many sera protect mice so well, whereas others do not, may be considered as valuable information, though the relation between mouse protection and human protection is not yet established. Steps toward working out a standardized mouse protection test have been made. Mishulow, Cohen, and Rake (*13*) (*15*) have published preliminary reports in this field.

Within the last few years an antitoxin for the treatment of meningococcic infection has been developed by Ferry (*16*), by immunizing horses with toxic filtrates of broth cultures of meningococci. Some excellent results have been reported to have followed its use (*17*). Various lots of antitoxin undoubtedly vary in efficacy, as do the various lots of the usual antibacterial serum, and this will result in conflicting reports of its value until such time as its standardization becomes more satisfactory. Toxin-antitoxin neutralization has not been demonstrated successfully in laboratory animals, nor do the antitoxins contain sufficient demonstrable antibodies to allow the use of arbitrary test tube methods. On the other hand, many lots of antitoxin protect mice well against meningococcus infection. Thus far, the only method of standardizing the antitoxin is by the partial neutralization of skin tests in human beings. The ideal serum should perhaps be both antibacterial and antitoxic.

After a good serum has been prepared and standardized, how should it be given? There has been much discussion on this question, and it is difficult to observe any rules, as any case may seem to be a law unto itself. This probably accounts for the fact that the person who is most successful in treating meningitis is usually the person who has had most experience with the disease. All are agreed that much depends on giving it as early as possible. Intraspinal therapy has long been most common. The chief advantage of this method has been that it enables the serum to come into direct contact with the meninges. If, as is commonly thought, the serum acts directly on the meningococci, this would indeed seem to be the most rational mode of administration. Some physicians feel that the serum does not always reach the infection—that with a purulent and viscid spinal fluid the serum remains in the spinal canal where it was injected and is drawn out again when the next spinal tap is made.

A factor often overlooked is the toxicity of horse serum for the meninges. Acute and fatal meningitis is produced in guinea pigs and rabbits by intracisternal injection of very small amounts of many normal horse sera. There are instances on record of "aseptic meningitis" following intraspinal injection in human beings. A really excellent serum may apparently do so much good that the irritation that it causes may be a minor consideration; but if such serum therapy is carried on too long, the continued irritation may delay the patient's recovery. According to some very excellent clinicians it is almost as important to know when to stop giving serum as to know when to start it.

Intravenous serum therapy, both in combination with intraspinal therapy and alone, is being used more and more often. Since meningococcus meningitis usually begins as a septicemia, and a severe toxemia is usually evident, intravenous administration of serum would seem to have a rational basis. The usual procedure is to dilute the serum greatly with physiological saline or glucose solution before injecting it intravenously, and some physicians make it a rule to add adrenalin. Since meningitis patients often become very dehydrated, this large amount of fluid serves an additional purpose. Caution must be exercised in administering serum by this route until it has been determined that the patient is not hypersensitive to horse serum.

It is not entirely certain how much of the serum that is given intravenously reaches the meninges, and so a combination of intravenous with intraspinal therapy is most often employed. But some clinicians are warm advocates of the intravenous method alone (*17*). They believe that, by avoiding the irritating effect of serum on the meninges, lumbar puncture to relieve increased pressure does not have to be done so frequently.

Since sulfanilamide and its related compounds have been shown to be so useful in streptococcus infections, its effects upon other microorganisms have been investigated. Buttle, Gray, and Stephenson (*18*), Proom (*19*), and workers at the National Institute of Health (Rosenthal, Bauer and Branham) (*20*) have found sulfanilamide to exert a marked curative action in mice infected with meningococci.

Disulfanilamide, prepared by Bauer (*20*), has been found to be more effective than sulfanilamide, and less toxic though also less soluble.

A comparison of the curative action in mice of sulfanilamide with that of polyvalent antimeningococcic serum has indicated a marked difference in individual strains of meningococci. With some strains the drug was more effective; with others the serum was more effective; with still others the drug and the serum were equally effective. This led us to investigate the combined action of the drug and serum (*21*). It was found that, with all strains of meningococci that were tested in mice, the combination was far more effective than either alone. The curative action was more than could be accounted for by the sum of the effect of the two agents; there seemed to be some kind of synergistic action. Those observations have been confirmed by Brown (*22*).

Several reports of the successful use of the drug alone in clinical cases of meningitis have appeared in recent journals. No reports of cases treated with both drug and serum have yet been published, but such treatment is being used in several places. The author has seen at least 15 cases and has been told of others in which this combined therapy has been employed and the results have been very promising. Among these 15 cases there was one death. This patient was a 50-year-old man with heart complications who was admitted to the hospital in a coma from which he never roused. Before allowing ourselves to become too enthusiastic about the clinical use of this combined drug and serum therapy we must remember that this was not an epidemic period and that relatively mild cases would be expected, and also, that, with the exception of the one fatal case, the patients receiving this treatment were in a decidedly favorable age group, i. e., 12 to 25 years.

DISCUSSION

It is becoming more and more evident that it is necessary to use cultures of meningococci which are good antigens in order to make good serum. The best antigens may not necessarily be the most recent or the most virulent strains. Just how such strains are to be chosen is a subject of much study at the present time.

Some better way of standardizing serum than the commonly used agglutination test is important. Good sera do seem to have a high agglutinin content, but not all good agglutinating sera have an equally useful effect therapeutically.

At the present time a mouse protection test seems promising. There are so many variable factors involved in such a test that standardization of the technique is difficult, but it will be necessary if such tests are to be compared with each other.

The relation between the protective action of any given serum for mice and for man can be known only through the help of the clinician.

Every lot number of serum is different. Each represents a pool of serum in different proportions from several different horses. Each has passed the standardized agglutination test required by the United States Government for its release for distribution. But all do not help the patient equally; sometimes one will be more helpful in one case, and another in other cases; occasionally, one will seem particularly good with all patients. What constitutes this difference? These serums are now all being subjected to intensive laboratory study. If the clinician can require the lot number of every serum used to be recorded on his patient's chart as a matter of record, much useful information about the clinical value of the serums may be obtained, and a comparison with the laboratory findings can be made. Through such a collaboration we may perhaps some day find out just what constitutes a good antimeningococcus serum and how to make it.

At the present time it seems likely that certain drugs may prove to be a useful adjunct to serum in treating meningococcus infections.

REFERENCES

(*1*) Jochman, G.: Versuche zur Serodiagnostik und Serotherapie der epidemischen Genickstarre. Deut. Med. Wchnschr., **32:** 788 (1906).

(*2*) Flexner, S.: The results of the serum treatment in thirteen hundred cases of epidemic meningitis. J. Exp. Med., **17:** 553 (1913).

(*3*) Dopter, C.: Étude de quelques germes isolés du rhino-pharynx, voisins du méningocoque (parameningococcus). C. R. Soc. de Biol., **67:** 74 (1909).

———: Research Society Reports: Observations on serotherapy for cerebrospinal meningitis. Med. Bull., **1:** 338 (1918).

(*4*) Wollstein, M., Parameningococcus and its antiserum. J. Exp. Med., **20:** 201 (1914).

(*5*) Nicolle, M., Debains, E., and Jouan, C.: Études sur les méningocoques et les serums antiméningococciques. Ann. l'Inst. Past., **32:** 150 (1918).

(*6*) Griffith, F.: III. Identification of the meningococcus in the naso-pharynx with special reference to serological reactions. Local Govt. Bd. Rep., New Series, No. 110, 41 (1916).

Scott, W. M.: IV. A study of meningococci occurring in the spinal fluid and of similar organisms in the naso-pharynx. Id., p. 56.

———: A further study of the serological reactions of meningococci from the spinal fluid and the naso-pharynx, with special reference to their classification and to the occurrence of the latter among normal persons. J. Hyg., **17:** 191 (1918).

(*7*) Gordon, M. H., and Murray, E. D. G.: Identification of the meningococcus. J. Roy. Army Med. Corps, **25:** 411 (1915).

(*8*) Gordon, M. H.: The endotoxin of the meningococcus. Brit. Med. J., **1:** 110; **2:** 335 (1918).

(*9*) Flexner, S., and Jobling, J. W.: Serum treatment of epidemic cerebrospinal meningitis. J. Exp. Med., **10:** 141, 690 (1908).

(*10*) Hitchens, A. P., and Robinson, G. H.: Studies on antibacterial serums. I. Standardization of antimeningitis serum. J. Immunol., **1:** 345 (1916).

(*11*) Branham, S. E., and Lillie, R. D.: Notes on experimental meningitis in rabbits. Pub. Health Rep., **47:** 1683 (1932).

———: Observations on experimental meningitis in rabbits. Ibid., **47:** 2137 (1932).

Branham, S. E., Lillie, R. D., and Pabst, A. M.: Experimental meningitis in guinea pigs. Pub. Health Rep., **52:** 1135 (1937).

Zdrodowski, P., and Voronine, E.: Recherches expérimentales sur la méningite cérébrospinale. Ann. l'Inst. Past., **48:** 617 (1932).

Zdrodowski, P., and Golinewitch, H.: Infection expérimentale des lapins et titrage des sérums antimicrobiens par la méthode sous-arachnoïdienne. Ibid., **53:** 120 (1934).

(12) Branham, S. E., and Pabst, A. M.: Serum studies in experimental meningitis. Lack of protection for rabbits and guinea pigs. Pub. Health Rep., 52: 1143 (1937).

(13) Miller, C. P.: A study of experimental meningococcal infection. II. Course of infection. Proc. Soc. Exp. Biol. and Med., 32: 1138 (1935).

Branham, S. E.: Protection of mice against meningococcus infection by polyvalent antimeningococcic serum. Pub. Health Rep., 50: 768 (1935).

Rake, G.: A method for titrating the protective action of antimeningococcal serum. Proc. Soc. Exp. Biol. and Med., 32: 1175 (1935).

Mishulow, L., Melman, M., and Sklarsky, R.: A mouse protection test for standardizing antimeningococcus serums. J. Lab. and Clin. Med., 21: 406 (1936).

Cohen, S. M.: A study of the virulence of meningococcus strains and of the protective activity of antimeningococcus sera. J. Immunol., 30: 203 (1936).

(14) Miller, C. P.: Experimental meningococcal infection in mice. Science, 78: 340 (1933).

———: A study of experimental meningococcali nfection. I. Method. Proc. Soc. Exp. Biol. and Med., 32: 1136 (1935).

(15) Rake, G.: The mouse protection test in the standardization of antimeningococcus serum. Can. Pub. Health J., 28: 265 (1937).

(16) Ferry, N. S., Norton, J. P., and Steele, A. H.: Studies on the properties of bouillon filtrates of the meningococcus: Production of a soluble toxin. J. Immunol., 21: 293 (1931).

(17) Hoyne, A.: Meningococcus meningitis. A new form of therapy. J. Am. Med. Assoc., 104: 980 (1935).

———: Intravenous treatment of meningococcus meningitis with meningococcus antitoxin. J. Am. Med. Assoc., 107: 478 (1936).

Banks, H. S.: A note on Ferry's meningococcus antitoxin in the treatment of acute cerebrospinal fever. Lancet, 228: 856 (1935).

Lindsay, Johnson, and Greening: J. Okla. Med. Assoc., 29: 293 (1936).

Fish, C.: J. Iowa Med. Soc., 26: 307 (1936).

(18) Buttle, G. A. H., Gray, W. H., and Stephenson, D.: Protection of mice against streptococcal and other infections by p-aminobenzenesulphonamide and related substances. Lancet, 1: 1286 (1936).

(19) Proom, H.: Therapeutic action of p-aminobenzenesulphonamide in meningococcal infection of mice. Lancet, 1: 16 (1937).

(20) Rosenthal, S. M., Bauer, H., and Branham, S. E.: Studies in chemotherapy. IV. Comparative studies of sulphonamide compounds in experimental pneumococcus, streptococcus, and meningococcus infections. Pub. Health Rep., 52: 662 (1937).

(21) Branham, S. E., and Rosenthal, S. M.: Studies in chemotherapy. V. Sulphanilamide, serum, and combined drug and serum therapy in experimental meningococcus and pneumococcus infections in mice. Pub. Health Rep., 52: 685 (1937).

(22) Brown, T. M.: Protective action of sulfanilamide and antimeningococcus serum on meningococcus infection of mice. Bull. Johns Hop. Hosp., 61: 272 (1937.)

STUDIES ON TRICHINOSIS

V. The Incidence of Trichinosis as Indicated by Post-mortem Examinations of 1,000 Diaphragms[1]

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In the first paper of this series, Hall and Collins (*1*) made a preliminary report on the results obtained from a study of the incidence of trichinae as ascertained from the examinations of diaphragms of 300 necropsy cases. With a view to obtaining further data, possibly of greater statistical significance, on the extent of trichinosis in our sample and in its constituent population groups, the present authors examined 700 additional diaphragms, completing a proposed base series of 1,000 cases. The present paper reports the results obtained from a study of the zoological findings in the base series, and covers the 300 cases of Hall and Collins and our 700 cases, the total of 1,000 cases being considered as a unit. In order to facilitate comparison and to avoid unnecessary repetition, the general outline followed in Hall and Collins' paper is followed in this paper. Correlations of incidences in population groups with the socio-economic and other factors involved, based on the same series of 1,000 cases, will be considered in a later study in this series.

The 700 diaphragms examined in this study, as well as the 300 examined by Hall and Collins, were from unselected routine necropsies, and were obtained from the same hospitals listed by Hall and Collins—10 in Washington, D. C., and 1 in Baltimore, Md.—and, in addition, from 4 United States naval hospitals (Philadelphia, Pa.; Chelsea, Mass.; Brooklyn, N. Y.; and Portsmouth, Va.). Of the 1,000 cases, 824 were from Washington (D. C.) hospitals, 110 from the United States Marine Hospital, Baltimore, and 66 from the United States naval hospitals listed above. As Hall and Collins stated in regard to their cases, these 1,000 cases "represent to an unusual extent a cross section of a rather large number of the population groups of the United States," running "the range of childhood to old age, military and civil life, association with land and sea, sane individuals and mentally deranged hospitalized cases, black and white, male and female, and high and low economic-social status." Magath (*2*) thought that because of the use of the word "cadavers," the 300 diaphragms examined by Hall and Collins were from dissecting-room subjects. In correspondence with Dr. Hall, Dr. Magath has requested that attention be called to his misinterpretation of the source of the material

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[1] Following are the preceding articles of this series:

I. The incidence of trichinosis as indicated by post-mortem examinations of 300 diaphragms. By Maurice C. Hall and B. J. Collins. Pub. Health Rep., 52: 468 (1937). (Reprint 1816.)

II. Some correlations and implications in connection with the incidence of trichinae found in 300 diaphragms. By Maurice C. Hall and B. J. Collins. Pub. Health Rep., 52: 512 (1937). (Reprint 1817.)

III. The complex clinical picture of trichinosis, and the diagnosis of the disease. By Maurice C. Hall. Pub. Health Rep., 52: 539 (1937). (Reprint 1819.)

IV. The role of the garbage-fed hog in the production of human trichinosis. By Maurice C. Hall. Pub. Health Rep., 52: 873 (1937). (Reprint 1836.)

We wish to acknowledge our indebtedness to the individuals named by Hall and Collins (*1*) for their continued cooperation in supplying diaphragms and data, and also to Dr. Eugene C. Rice, Jr., and Dr. B. Manchester, at Children's Hospital, Washington, D. C., and to the following officers of the United States naval hospitals: Capt. F. E. Sellers, Philadelphia; Capt. R. A. Warner and Capt. E. C. White, Chelsea; Capt. C. M. George and Lt. Tilden I. Moe, Brooklyn; Capt. I. S. K. Reeves and Capt. R. A. Warner, Portsmouth. We are indebted to Dr. Selwyn D. Collins, principal statistician, United States Public Health Service, for his careful consideration of the statistical validity of our data.

METHOD

Both the direct microscopic technique and the digestion-Baermann technique were used by us in examining diaphragms for trichinae.

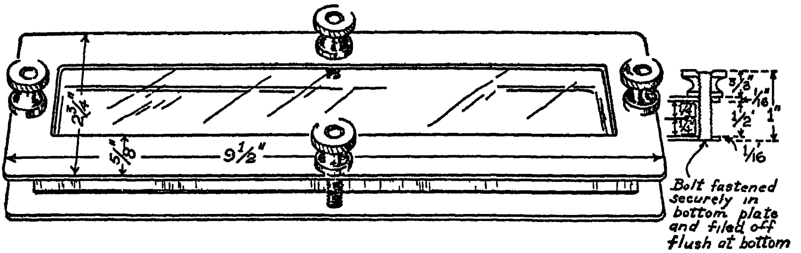
2¼"
5/8
9½"
3/8"
1/16"
1/2'
1"
1/16
Bolt fastened securely in bottom plate and filed off flush at bottom

FIGURE 1.—Metal compressor and glass slides used in the direct microscopic examination of muscle for trichinae.

Slight modifications in the two methods, as described by Hall and Collins, were made as the examinations progressed and improvements in technique suggested themselves. For the direct microscopic technique, 1 gram of muscle from various parts around and near the tendinous portions of the diaphragm was cut into small thin pieces, scissors being used for this cutting. These pieces were placed between two glass plates approximately 22 cm (8¾ inches) long by 5 cm (2 inches) wide and 5 mm thick, which were in turn pressed between two metal frames by four bolts and nuts (fig. 1). The 4-bolt-and-nut framework has the advantage over the 2-bolt-and-nut arrangement described by Hall and Collins and used in the examination of (approximately) the first 400 diaphragms, in that a more uniform pressure, with consequently a more uniform transparency of the muscle pieces, is obtained. The press preparation was then examined with the wide-field dissecting microscope, using 12.5 ocular and 1.7 objective. The number of cysts found was recorded in terms of trichinae per gram, and notation was made of the state of the cysts, whether calcified or not calcified, the degree and localization of calcification, and whether the trichinae were dead or alive.

For the digestion-Baermann technique, the diaphragm, after removal of the 1-gram sample, was weighed, finely ground, and digested in an incubator room at 37° C., in freshly prepared artificial gastric juice (5 grams commercial pepsin, 7 cc concentrated hydrochloric acid, 1 liter of water). We found that for samples of diaphragm weighing 50 grams or more 3 liters of artificial gastric juice were required for proper digestion. The mixture was thoroughly stirred with a glass rod at intervals of about one-half hour 4 or 5 times, and left in the incubator room for approximately 18 hours or longer. In many instances the entire diaphragm, in others only a very small portion, was received from hospitals. For amounts above 50 grams, multiples of 25 grams were used, as a rule; for amounts below 50 grams, all available material was used. The maximum amount used for digestion was 200 grams; the smallest amount was 5 grams (used in only 3 cases); the average for 1,000 cases was 98 grams.

After digestion, the supernatant fluid was siphoned off to within several inches of the bottom of the container, care being taken not to roil the digested material which had settled on the bottom. The material remaining after the removal of the supernatant fluid was mixed with water at a temperature of 37° to 45° C., and the mixture poured on an 80-mesh screen in a Baermann apparatus, sufficient water being added to cover the screen, and allowed to stand 1 hour or longer. About 200 cc were then drawn off into a conical sedimentation glass. Beginning with the thirty-fifth diaphragm and continuing through the five hundredth, the funnel of the Baermann apparatus was emptied of fluid, the apparatus was again filled with warm water, and after being left to stand 1 hour or longer, 200 cc were again drawn off. Since there was the possibility that, in drawing off the water, cysts or inactive or dead worms, if these were present on the screen, would be carried through the screen mesh and lost with the fluid, this procedure was modified. Beginning with the five-hundred-and-first diaphragm, after the first draw of 200 cc, warm water was added to the fluid already in the funnel, the material on the screen was agitated by shaking the screen gently, and after an hour or so the second 200 cc were drawn off. In the first 500 examinations there were 2 cases in which the first Baermann was negative and the second Baermann was found positive. Both were cases with dead worms, found positive also by the direct microscopic method. In the second 500 examinations there were 6 cases found negative on the first draw and positive on the second draw, and all were very light live infestations missed by the direct microscopic method.

The fluid in the sedimentation glasses was allowed to stand about 2 hours, and the material that settled to the bottom was pipetted into a syracuse dish and examined with the wide field dissecting microscope, using 12.5 ocular and 1.7 objective. In positive findings, the Baermann apparatus was placed in an incubator room overnight, and additional amounts examined the next day until they were negative. The trichinae were counted and the numbers recorded.

In a survey of this kind, in which as many as 12 and 14 diaphragms were handled in a day, great care had to be exercised to avoid contamination. A separate grinder and set of instruments were used for each diaphragm, and the equipment was washed thoroughly and sterilized by dry heat before being used again. It was found that sterilization in an autoclave did not materially alter the appearance of trichina larvae, whereas sterilization by dry heat at a temperature of 180° C., for at least 2 hours, so distorted the larvae that there was no possibility of mistaking them for freshly isolated ones. All of the glassware used, such as beakers, sedimentation glasses, etc., was of pyrex or of other glass of equally high resistance that withstands dry heat at high temperatures, with the exception of the glass funnels of the Baermann apparatus. These funnels were washed thoroughly and immersed overnight in a 10 percent solution of sodium hydroxide that would destroy any trichinae that might be present. The copper screens were washed and scrubbed with a stiff brush, and carefully flamed over a bunsen burner.

FINDINGS BY THE MICROSCOPIC AND THE DIGESTION-BAERMANN METHODS

Hall and Collins (*1*) found that the use of either the direct microscopic technique alone or the digestion-Baermann technique alone has definite limitations in picking up positive cases, and noted that even the use of both techniques will undoubtedly fail to detect trichinae in a small minority of cases, notably in very light infestations with dead trichinae. Our own observations support this view. Our final incidence figure of 17.4 percent for 1,000 cases examined is higher than Hall and Collins' incidence figure of 13.67 percent for the first 300 cases examined, and yet it is probable, judging from the data obtained and presented below, that an incidence of 17.4 percent is a bit below the actual incidence for our series.

From a study of table 1 it will be seen that dead trichinae were found in the majority of cases. Of 174 positive cases, there were 80, or 45.9 percent, with dead trichinae only; 60, or 34.4 percent, with live trichinae only; and 34, or 19.5 percent, with both live and dead trichinae. Comparing the findings by the microscopic and the digestion-Baermann methods, we have the following results:

Microscopic technique.—This technique detected 118 of 174 positives, or 67.8 percent, and failed to detect 56 positives, or 32.2 percent; it failed in slightly less than one-third of the positive cases.

Out of 80 cases in which we found only dead trichinae, the microscopic examination detected 74 cases, or 92.5 percent, and missed 6 cases, or 7.5 percent. Out of 60 cases in which we found only live trichinae, the microscopic examination detected 13 cases, or 21.7 percent, and missed 47 cases, or 78.3 percent. Out of 34 cases in which we found both live and dead trichinae, the microscopic examination detected 31 cases, or 91.2 percent, and missed 3 cases, or 8.8 percent.

Of the 56 positives missed by the microscopic technique, all but one were light infestations of less than one trichina per gram. The one case, of approximately 3 trichinae per gram (37 cysts found in 13 grams digested), missed by this technique was an infestation with dead trichinae which, according to our experience, should have been detected by the microscopic technique and not by the digestion-Baermann technique. The failure of the microscopic method in this case might readily be attributed to uneven distribution of trichinae in the muscle—especially as notable variations in distribution and in intensity of infestation in different parts of the same diaphragm have often been observed by us and by others—in spite of the fact that our 1-gram sample was composed of several small pieces of muscle taken from different parts of the very small amount, only 14 grams, of diaphragm provided. The element of chance plays a role in the sampling, and it is evident that the microscopic method not only will miss light infestations of less than 1 trichina per gram quite often, but also will miss somewhat heavier infestations occasionally.

Digestion-Baermann technique.—This technique detected 114 of 174 positives, or 65.5 percent, and failed to detect 60 positives, or 34.5 percent; it failed in slightly more than one-third of the positive cases.

The digestion-Baermann technique detected all of the live and all of the mixed cases, so that we may reasonably assume that very light infestations in which live worms are present will seldom be missed by this technique.

Out of a total of 80 cases in which we found only dead trichinae, the digestion-Baermann method detected 20 cases, or 25 percent, and missed 60 cases, or 75 percent. In the 60 cases of dead trichinae missed by the digestion method, trichinae were found by the microscopic method in numbers from 1 to 600 per gram, with an average of approximately 15 per gram. All but 3 cases, these having 600, 54, and 36 trichinae per gram, had 14 or less trichinae per gram. Of the 20 cases of dead trichinae detected by the digestion-Baermann method, 6 cases were not detected by the microscopic method. In the 14 dead cases positive by both methods, the numbers of trichinae per gram found by the microscopic technique were 3, 3, 4, 5, 11, 12, 17, 21, 31, 40, 51, 374, 947, 993. It is not surprising that the digestion-Baermann technique is not very efficient in detecting dead infestations, considering that it is entirely by chance that cysts and dead worms fall through the screen and settle with the material that is drawn off for examination. In some instances, cysts, and, less often, dead worms, will float, and these trichinae will be missed; obviously, if all trichinae are lost in this way, the case will be negative by this technique.

The combined microscopic and digestion-Baermann techniques agreed in only 58 cases, or 33.3 percent, failing to agree in two-thirds of the cases. We have seen that either technique alone failed to detect approximately one-third of the positive cases. The total positive findings, then, are approximately of this order: One-third of total positives, especially those with dead trichinae, detected by direct microscopic examination only; one-third of total positives, especially those with live trichinae, detected by digestion-Baermann examination only; one-third of total positives, especially heavy, or mixed infestations, detected by both examinations. Each method supplements the other, and both must be used if a fairly accurate incidence figure is to be obtained.

INCIDENCE

Of a total of 1,000 diaphragms, 174 were found infested with trichinae, an incidence of 17.4 percent. Details of our positive findings are given in table 1.

The first 300 cases of this series, reported by Hall and Collins, included 41 positives, or 13.67 percent. There were 15 positives in the first 100 cases, 14 in the second 100 cases, and 12 in the third 100 cases. The positive findings per 100 cases for consecutive series in the remaining 700 cases were as follows: 24 in the fourth 100 cases, 14 in the fifth, 16 in the sixth, 17 in the seventh, 18 in the eighth, 24 in the ninth, 20 in the tenth. Any discussion of range of variation is postponed until a later date, when a study of several thousand diaphragms will have been completed.

Even with a range of variation from 12 positives in 100 cases to 24 positives in 100 cases, subsequent examinations of a similar series of 1,000 diaphragms from the same hospitals and from the same population groups, similarly represented, using the same techniques, should yield approximately the same percentage of positives. Statistically, the standard deviation of our percentage of positive cases, 17.4 percent, as computed by the formula $\sqrt{\frac{pq}{n}}$, where p is the percentage of positive cases, q the percentage of negative cases, and n the total number of cases examined, is ± 1.2; so that on repeated samples of 1,000 each of the type of autopsy material here sampled, we might

TABLE 1.—*Findings for positive cases*

Positive number	State of trichinae	Findings		Microscopic		Digestion-Baermann			
		Microscopic	Digestion	Number of cysts per gram	State of cysts	Amount of diaphragm digested	Total number of larvae recovered [1]	Number per gram	State of larvae
						Grams			
1	Live	−	+	0		150	28	0.187	Live.
2	Dead	+	−	600	Calcified	100	0	0	
3	Live	−	+	0		150	3	0.02	Do.
4	Dead	+	−	54	Calcified	200	0	0	
5	Live	+	+	5	Live	50	24	0.48	Do.
6	Mixed	+	+	85	83 calcified; 2 live	100	4	0.04	1 dead; 3 live.
7	Dead	+	−	12	Calcified	150	0	0	
8	Live	+	+	1	Live	100	4	0.04	Live.
9	do	−	+	0		50	2	0.04	Do.
10	Dead	+	−	2	Calcified	200	0	0	
11	Live	−	+	0		200	7	0.035	Live.
12	Dead	+	+	21	Calcified	100	1	0.01	Dead.
13	do	−	+	0		150	2	0.013	Do.
14	Mixed	−	+	0		50	4	0.08	1 dead; 3 live.
15	Live	−	+	0		15	2	0.133	Live.
16	Dead	+	−	14	Calcified	100	0	0	
17	do	−	+	0		100	3	0.03	Dead.
18	Live	−	+	0		17	1	0.058	Live.
19	Dead	+	+	3	Calcified	100	2	0.02	Dead.
20	do	+	−	2	do	150	0	0	
21	Mixed	+	+	47	do	50	60	1.2	35 dead; 25 live.
22	Dead	+	+	5	do	50	2	0.04	Dead.
23	do	+	−	1	do	150	0	0	
24	do	+	−	3	do	150	0	0	
25	Mixed	+	+	5	Polar calcification; dead.	100	212	2.12	3 dead; 209 live.
26	Live	−	+	0		100	43	0.43	Live.
27	do	−	+	0		100	3	0.03	Do.
28	Dead	+	+	993	Calcified	100	23 (c)	0.23	Calcified.
29	do	+	−	11	do	100	0	0	
30	Mixed	+	+	16	12 calcified; 4 live	50	39	0.78	2 dead; 37 live.
31	do	+	+	2	Polar calcification	100	6	0.06	5 dead; 1 live.
32	Live	−	+	0		100	8	0.08	Live.
33	Mixed	−	+	0		200	52	0.26	2 dead; 50 live.
34	do	+	+	3	1 calcified; 2 live	100	177	1.77	126 dead; 51 live.
35	Live	−	+	0		200	4	0.02	Live.
36	Dead	+	−	3	Calcified	100	0	0	
37	do	+	−	1	do	50	0	0	
38	do	+	−	12	do	50	0	0	
39	Mixed	+	+	7	do	50	1	0.02	Do.
40	do	+	+	1	do	200	69	0.345	Do.
41	Live	+	+	2	Partially calcified, apparently live.	175	21	0.12	Do.
42	do	−	+	0		150	1	0.006	Do.
43	Dead	+	+	11	8 calcified; 3 not calcified.	100	1 (c)	0.01	Dead.
44	do	+	+	947	Calcified	200	60 (c)	0.3	Calcified.
45	Live	−	+	0		125	1	0.008	Live.
46	Mixed	+	+	5	3 polar calcification; 2 not calcified; live and dead.	150	132	0.88	Do.
47	Dead	−	+	0		125	6	0.048	Dead.
48	do	−	+	0		200	1	0.005	Do.
49	Mixed	+	+	2	1 dead; 1 polar calcification, live.	125	23	0.184	Live.
50	Dead	+	+	40	Calcified	150	1 (c)	0.006	Calcified.
51	Mixed	+	+	18	4 completely calcified; 14 polar calcification, live.	50	279	5.58	Live.
52	do	+	+	1	Periphery calcified; apparently live.	75	11	0.146	10 live; 1 cyst dead.
53	Dead	+	−	2	Calcified	100	0	0	

TABLE 1.—*Findings for positive cases*—Continued

Positive number	State of trichinae	Findings		Microscopic		Digestion-Baermann			
		Microscopic	Digestion	Number of cysts per gram	State of cysts	Amount of diaphragm digested	Total number of larvae recovered	Number per gram	State of larvae
						Grams			
54	Live	−	+	0		75	1	0.013	Live.
55	Dead	+	−	2	Calcified	75	0	0	
56	do	+	−	2	Polar calcification	150	0	0	
57	do	+	−	12	Calcified	100	0	0	
58	Live	−	+	0		75	7	0.093	Live.
59	Mixed	+	+	1	Dead	75	4	0.053	Do.
60	do	+	+	13	Calcified	75	2	0.026	1 live; 1 cyst, larva calcified.
61	do	+	+	1	do	100	1	0.01	Live.
62	do	+	+	2	Not calcified; live	175	7	0.04	6 live; 1 cyst, larva calcified.
63	Dead	+	−	3	2 partially calcified, larvae calcified; 1 polar calcification.	50	0	0	
64	Live	−	+	0		125	2	0.016	Live.
65	Mixed	+	+	1	Polar calcification; dead.	75	56	0.746	Do.
66	Dead	+	+	3	Calcified	150	4 (c)	0.026	Calcified.
67	Mixed	+	+	2	Polar calcification; 1 dead, 1 live.	100	40	0.4	39 live; 1 cyst.
68	Dead	+	−	1	Slightly calcified	75	0	0	
69	Live	−	+	0		75	3	0.04	Live.
70	do	−	+	0		100	27	0.27	Do.
71	Dead	+	−	2	Calcified	50	0	0	
72	do	+	−	1	do	75	0	0	
73	do	+	+	4	Not calcified, larvae degenerated.	18	1 (c)	0.055	Dead.
74	do	+	−	1	Calcified	75	0	0	
75	Live	+	+	6	Not calcified	125	376	3.008	Live.
76	Dead	+	−	3	Not calcified, larvae degenerated.	100	0	0	
77	do	+	−	2	Calcified	75	0	0	
78	Live	−	+	0		200	9	0.045	Live.
79	Dead	+	−	13	Calcified	75	0	0	
80	do	+	−	9	Polar calcification	125	0	0	
81	Live	−	+	0		100	3	0.03	Live.
82	Dead	+	−	1	Only one pole calcified, larva degenerated.	25	0	0	
83	Live	−	+	0		150	1	0.006	Live.
84	Dead	+	−	2	Partially calcified, larvae degenerated.	36	0	0	
85	Live	−	+	0		150	42	0.28	Live.
86	do	−	+	0		100	8	0.08	Do.
87	do	−	+	0		50	31	0.62	Do.
88	do	−	+	0		25	1	0.04	Do.
89	do	−	+	0		75	9	0.12	Do.
90	do	+	+	1	Live	100	1	0.01	Do.
91	Dead	+	−	2	Calcified, degenerated	75	0	0	
92	do	+	−	6	Calcified	25	0	0	
93	do	+	−	6	Degenerated	50	0	0	
94	Mixed	+	+	1	Larva slightly calcified; dead.	35	1	0.028	Do.
95	Dead	+	−	1	Calcified	150	0	0	
96	Live	−	+	0		150	9	0.06	Do.
97	do	−	+	0		125	1	0.008	Do.
98	Mixed	+	+	14	10 calcified, dead; 4 not calcified, live.	125	13	0.104	Do.
99	do	+	+	2	Polar calcification; dead.	11	10	0.909	Do.
100	Dead	+	−	3	Calcified	20	0	0	
101	do	+	−	1	Larva degenerated	125	0	0	
102	do	+	−	3	Calcified	13	0	0	
103	do	+	−	36	do	50	0	0	
104	do	+	−	10	do	75	0	0	
105	Live	−	+	0		100	43	0.43	Do.
106	Dead	+	−	5	Calcified	100	0	0	
107	do	+	−	3	do	100	0	0	

TABLE 1.—*Findings for positive cases*—Continued

Positive number	State of trichinae	Findings		Microscopic		Digestion-Baermann			
		Microscopic	Digestion	Number of cysts per gram	State of cysts	Amount of diaphragm digested	Total number of larvae recovered	Number per gram	State of larvae
						Grams			
108	Mixed	−	+	0		120	15	0.125	4 dead; 11 live.
109	Dead	+	−	1	Calcified	200	0	0	
110	do	+	−	4	do	100	0	0	
111	do	+	+	31	do	200	43 (c)	0.215	Calcified.
112	do	+	+	51	do	100	32	0.32	Dead.
113	Mixed	+	+	1	Dead	50	1	0.02	Live.
114	Dead	+	−	1	Calcified	75	0	0	
115	do	+	−	2	Degenerated	100	0	0	
116	Mixed	+	+	6	Calcified	175	3	0.017	Do.
117	Live	+	+	251	Bipolar calcification	75	4,860	64.8	Do.
118	Dead	+	−	2	Calcified	75	0	0	
119	do	+	−	5	Calcified, degenerated	150	0	0	
120	Live	+	+	11	Bipolar calcification	200	107	0.535	Do.
121	do	+	+	2	do	50	15	0.3	Do.
122	Dead	−	+	0		50	1	0.02	Dead.
123	Mixed	+	+	7	Some calcified, dead; others live.	100	2	0.02	Live.
124	Live	−	+	0		200	2	0.01	Do.
125	Mixed	+	+	1	Bipolar calcification; live.	150	4	0.026	3 dead; 1 live.
126	do	+	+	2	Bipolar calcification; dead.	50	7	0.14	Live.
127	Live	−	+	0		25	6	0.24	Do.
128	do	−	+	0		100	10	0.1	Do.
129	do	−	+	0		75	15	0.2	Do.
130	do	−	+	0		75	14	0.186	Do.
131	Mixed	+	+	5	Bipolar calcification; 3 live.	125	14	0.112	8 live; 6 cysts dead.
132	Dead	+	−	12	Calcified	125	0	0	
133	Mixed	+	+	57	do	75	3	0.04	1 live; 2 cysts dead.
134	Dead	+	−	6	do	75	0	0	
135	do	+	+	17	do	175	1 (c)	0.005	Calcified.
136	do	+	−	1	Bipolar calcification	125	0	0	
137	Mixed	+	+	1	Not calcified, larva degenerated.	125	8	0.064	Live.
138	Dead	+	+	374	Calcified, some degenerated.	50	19 (c)	0.38	Calcified.
139	Live	+	+	7	Bipolar calcification	150	265	1.766	Live.
140	do	−	+	0		50	1	0.02	Do.
141	Dead	+	−	1	Calcified	125	0	0	
142	Live	+	+	1	Bipolar calcification	125	79	0.632	Do.
143	do	−	+	0		75	5	0.066	Do.
144	Dead	+	−	1	Calcified	25	0	0	
145	Live	−	+	0		50	2	0.04	Do.
146	Dead	+	−	1	Calcified	7	0	0	
147	Live	+	+	1	Not calcified	100	2	0.02	Do.
148	do	+	+	7	6 not calcified; 1 bipolar calcification.	150	594	3.96	Do.
149	Dead	+	−	1	Calcified	50	0	0	
150	do	+	−	4	2 bipolar calcification; 2 degenerated.	18	0	0	
151	do	+	−	1	Calcified, degenerated	50	0	0	
152	do	+	−	1	Calcified	100	0	0	
153	do	+	−	2	do	100	0	0	
154	Live	−	+	0		50	42	0.84	Do.
155	Dead	+	−	5	Slightly calcified, larvae dead, all but one degenerated.	22	0	0	
156	Live	−	+	0		50	5	0.1	Do.
157	Dead	+	−	1	Not calcified	100	0	0	
158	Live	−	+	0		75	1	0.013	Do.
159	Dead	+	−	1	Bipolar calcification, larva degenerated.	75	0	0	
160	Mixed	+	+	11	4 not calcified, live; 7 calcified, dead.	100	277	2.77	267 live; 10 cysts dead.
161	Live	+	+	1	Bipolar calcification	50	2	0.04	Live.
162	do	−	+	0		50	1	0.02	Do.
163	Dead	+	+	12	Calcified	75	1 (c)	0.013	Calcified.

TABLE 1.—*Findings for positive cases*—Continued

Positive number	State of trichinae	Findings		Microscopic		Digestion-Baermann			
		Microscopic	Digestion	Number of cysts per gram	State of cysts	Amount of diaphragm digested	Total number of larvae recovered	Number per gram	State of larvae
						Grams			
164	Live	−	+	0		75	3	0.04	Live.
165	do	−	+	0		125	11	0.088	Do.
166	Dead	+	−	2	Calcified	15	0	0	
167	Live	−	+	0		30	3	0.1	Do.
168	Dead	+	−	13	Calcified	19	0	0	
169	Live	−	+	0		200	24	0.12	Do.
170	Mixed	+	+	16	Slightly calcified; 7 live, 9 dead.	175	14	0.08	11 live; 3 cysts dead.
171	Live	−	+	0		150	2	0.013	Live.
172	do	−	+	0		150	3	0.02	Do.
173	do	−	+	0		28	1	0.035	Do.
174	Dead	−	+	0		13	37 (c)	2.846	Calcified.

Number with dead trichinae only, 80, or 45.9 percent.
Number with live trichinae only, 60, or 34.4 percent.
Number with live and dead trichinae, 34, or 19.5 percent.

expect a range of variation due to chance as high as 19.8 percent and as low as 15.0 percent, this range indicating the range of 2 standard deviations above or below the mean of our sample.

In all previous studies of the incidence of trichinosis in the United States, based on examinations of the diaphragm or other muscles of the body, investigators have used either the microscopic method alone or the digestion-Baermann method alone. Hall and Collins (*1*) have tabulated all the reports on such incidence studies published in the literature, a total of 8 investigations, with a total number of 1,478 examinations and a total number of 181 positive cases.

Since the publication of their paper, another report on the incidence of trichinosis has appeared.[2] Magath (*2*) examined, by the direct microscopic method, 2 grams of muscle, including diaphragm, intercostal muscles, rectus abdominis, and sternocleidomastoid, from 220 patients dying at the Mayo Clinic, and he reported finding trichinae in 17, or an incidence of 8 percent. He also tabulates the results of the earlier examinations made for trichinae. In his list are included 290 cases, referred to Glazier (*3*), over and above those recorded by Hall and Collins, which 290 cases we believe should be omitted from statistical consideration. They are mentioned by Glazier in quotations from letters received from pathologists and anatomists in the United

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[2] After the completion of this paper there came to our attention an abstract by Thomas B. Pote, St. Louis, Mo., "Excerpts from a Study of the Incidence of *Trichinella spiralis* in Man," The Bureau Veterinarian, 1937, v. 13 (6), pp. 1-2. Pote examined diaphragm and pectoral, intercostal, and rectus abdominis muscles from 1,060 routine autopsy cases. "More than twelve thousand uncut and unstained sections from these specimens were examined microscopically. One hundred sixty-three, or 15.37 percent, of the one thousand sixty persons studied were found to be infested with *Trichinella spiralis*."

States, and cover necropsies in which no special search for trichinae was made. Incidence figures for more or less accidental findings do not have the validity of those based on definite examinations for trichinae, and only the latter examinations are considered here.

There are, accordingly, 1,698 cases with 198 positives, based on the use of the microscopic technique alone or the digestion-Baermann technique alone, in the available American literature. Combined with our 1,000 cases with 174 positives, based on the use of both techniques, these cases incorporating the figures of Hall and Collins, we have a total of 2,698 cases with 372 positives, or an incidence of 13.8 percent. If both techniques, instead of one alone, had been used in the examinations of the 1,698 cases, judging from our results with the use of both techniques, the incidence figure would be higher and would be closer to the actual incidence of trichinae throughout the populations sampled.

Hall and Collins' table indicates that the microscopic technique alone was used in 676 cases, with 51 positive cases; and combining these with Magath's cases would give a total of 896 cases, with 68 positives. The digestion-Baermann technique alone was used in 802 cases, with 130 positive cases. The findings in our series of 1,000 cases indicate that the microscopic technique detected 118 of 174 positives, or 67.8 percent, and failed to detect 56 positives, or 32.2 percent; the digestion-Baermann technique detected 114 positives, or 65.5 percent, and failed to detect 60 positives, or 34.5 percent. Applying our correction figures to the results obtained by other workers, it appears that with the use of both techniques there would have been approximately 472 positives out of a total of 2,698 cases, or an indicated incidence of 17.5 percent. This figure is identical with the indicated incidence figure estimated by Hall and Collins on the basis of their data, and is practically identical with our figure of 17.4 percent for our base series of 1,000 cases. However, the 2,698 cases on which the incidence is computed is not a weighted sample, the low-incidence South being represented by only 200 cases, the Rocky Mountain States being unrepresented, and the entire sample having an urban basis, with the rural population practically unrepresented. A more precise figure for the United States might be based on a large series selected at random as a probably representative sample, and such a series is now being investigated in this laboratory.

INTENSITY OF INFESTATION

Following a classification presented in a table by Hall and Collins (*1*), we have divided our positive cases into seven arbitrary groups on the basis of number of trichinae found per gram, in order to show the intensity of infestation, and these groups are shown in table 2. The assignment to groups was made on the basis of the microscopic findings per gram whenever positive, because of their direct and positive character; the digestion-Baermann findings per gram were used for the other cases.

TABLE 2.—*Positive groups on a basis of trichinae per gram*

Group No.	Larvae per gram	Number of cases	Percent	Number in various states		
				Live	Mixed	Dead
1	Less than 1	55	31.6	47	3	5
2	1 to 10, inclusive	87	50	11	22	54
3	11 to 50, inclusive	23	13.2	1	7	15
4	51 to 100, inclusive	4	2.3	0	2	2
5	101 to 500, inclusive	2	1.2	1	0	1
6	501 to 1,000, inclusive	3	1.7	0	0	3
7	Over 1,000	0	0	0	0	0
Total		174	100.0	60	34	80

Our findings, in general, correspond to those of Hall and Collins. The highest percentage of cases is still in group 2, with groups 1 and 3 still following in that order. The number of cases in other groups is still too small to establish a sequence. Hall and Collins found that, in group 1, infestations with less than 1 trichina per gram, the large majority of cases showed only live trichinae, whereas in all other groups, with 1 or more larvae per gram, mixed infestations predominated over those with live larvae, and infestations with dead larvae predominated over both other groups. Live larvae only were found by them in groups 1 and 2, in contrast with the occurrence of cases with dead larvae through group 4 and in group 6. They suggested as a purely theoretical explanation of the apparent correlation of dead larvae with heavy infestations, that the rapidity with which trichinae die and calcify is proportional to the degree of infestation.

Our data sustain their theory, while still leaving the establishment of the theory or its disproof until we have a larger amount of data, including data from experiments on animals, a thing that might be quite conclusive. However, the table shows that we find, as Hall and Collins found, a preponderance of cases with only live trichinae present in only group 1, cases with less than 1 trichina per gram, in which group live trichinae make up 85 percent of cases and dead trichinae make up 9 percent of cases. In our table, mixed infestations still predominate over live ones, and dead infestations over both, in groups 2 and 3, with infestations from 1 to 10 and from 11 to 50 trichinae per gram. Beyond this point the figures become too small to have any significance statistically; but it is still true that mixed and dead infestations predominate over live ones in groups 4 and 6, and the numbers are equal in group 5. Somewhat more significant figures are obtained by taking the total 9 cases for groups 4 to 6, inclusive, covering the range from 51 to 1,000 trichinae per gram, from which it appears that we have in this total 1 live infestation, 2 mixed infestations, and 6 dead infestations, findings which are in line with the other data and with the theory.

For a total of 119 cases with 1 trichina or more per gram, 63 percent are cases with only dead trichinae, and only 11 percent are cases with only live trichinae. Since there is little likelihood of missing these heavier infestations, the predominance of dead infestations in this group can be accepted on its statistical basis and the evident effect of a time factor. There is still the possibility that infestations with less than 1 dead trichina per gram are being missed, as Hall and Collins (*1*) pointed out; and this possibility, as well as any indicated ratio of such dead infestations to live infestations with less than 1 trichina per gram, could be checked by complete microscopic examinations of an adequate series of entire diaphragms.

Even smaller amounts of diaphragm might be inspected to check the probabilities as to missed light infestations with dead trichinae. There were 56 positive Baermanns with less than 1 trichina per gram, with the direct microscopic examination negative, the 56 Baermann examinations detecting the equivalent of 5.644 trichinae per 56 grams, or an average of 0.102 trichina per gram, or approximately 1 trichina per 10 grams. For all Baermanns with less than 1 trichina per gram, with the direct microscopic examination either positive or negative, a total of 104 examinations, the Baermanns detected the equivalent of 15.127 trichinae per 104 grams, or an average of 0.145 trichina per gram, or approximately 1 trichina per 7 grams. Apparently, an examination of 100 samples of 10 grams each for dead trichinae, in cases negative on microscopic examination of 1 gram, would give a figure on which to consider the probable incidence of light dead infestations, assuming that the chance of detecting such cases in a 10-gram sample was at least approximately a 50-50 chance.

The theory that the larvae in heavy infestations die more rapidly than in light infestations carries as a corollary the postulate that the time during which heavy infestations can be found in a live condition is relatively short and, hence, that the chance of detecting them in this stage is much less than the chance of detecting them during the permanent state of death after they die. It does not eliminate the chance of detecting them alive. From our limited data, it appears that the chances of finding only live trichinae in infestations with from 11 to 1,000 trichinae per gram are 6 chances in 100 (2 live cases out of a total of 32). By contrast, the chances of finding live trichinae in infestations with less than 11 trichinae per gram are 41 chances in 100 (58 live cases out of a total of 142 cases), and in infestations with less than 1 per gram are 85 chances in 100 (47 live cases out of a total of 55 cases). In other words, the chance of finding only live trichinae in infestations with less than 1 trichina per gram is about seven times as great as the chance of finding only live trichinae in infestations with over 10 trichinae per gram. These differences appear to be significant, and our data still point to the likelihood that in light infestations trichinae live a long time, and that in heavy infestations there is a short period with only live trichinae, a longer period with mixed infestations, and a still longer period with only dead trichinae.

Hall and Collins (1), as already noted, state that the rapidity with which trichinae die and calcify is apparently proportional to the intensity of infestation. We have already shown that our data still sustain the idea that the rapidity with which they die is proportional to intensity of infestation; but since death may be unaccompanied by calcification, and calcification unaccompanied by death, the question as to whether rapidity of calcification also is proportional to intensity of infestation is here given separate consideration. The point is judged entirely on the existence of any degree of calcification whatever, without reference to the degree of partial, up to complete, calcification.

From table 3 it appears that in 55 cases of very light infestation, with less than 1 trichina per gram, calcification is present in 0 percent of cases; in 87 cases of what appears to be an intermediate group of infestations, with 1 to 10 trichinae per gram, calcification is present in 83 percent of the cases; and in 32 cases of the heavier infestations, with from 11 to 1,000 trichinae per gram, calcification is present in 100 percent of the cases. The percentages for calcification rise definitely as the infestations become heavier. The intensity of infestation at which calcification is hastened appears to lie in the range from 1 to 10 trichinae per gram.

TABLE 3.—*Infestations on the basis of intensity and calcification as found in all decades of age*

Age group	Less than 1 trichina per gram		1–10 trichinae per gram		11–50 trichinae per gram		51–100 trichinae per gram		101–500 trichinae per gram		501–1,000 trichinae per gram		Total cases	Total calcified
	Total cases	Calcified	Total cases	Calcified	Total cases	Calcified	Total cases	Calcified	Total cases	Calcified	Total cases	Calcified		
0–10	1	0	0	----	0	----	0	----	0	----	0	----	1	0
11–20	2	0	0	----	0	----	0	----	0	----	0	----	2	0
21–30	5	0	7	5	2	2	0	----	0	----	0	----	14	7
31–40	9	0	11	8	1	1	0	----	0	----	0	----	21	9
41–50	18	0	26	23	5	5	0	----	1	1	0	----	50	29
51–60	7	0	10	7	6	6	1	1	0	----	1	1	25	15
61–70	9	0	20	18	5	5	0	----	1	1	2	2	37	26
71–80	2	0	10	9	3	3	2	2	0	----	0	----	17	14
81–90	0	----	3	3	0	----	1	1	0	----	0	----	4	4
91–100	1	0	0	----	1	1	0	----	0	----	0	----	2	1
Age unknown	1	0	0	----	0	----	0	----	0	----	0	----	1	0
Total	55	0	87	73	23	23	4	4	2	2	3	3	174	105

Calcified: In 55 cases of less than 1 trichina per gram, 0 percent; in 87 cases of 1 to 10 trichinae per gram, 83 percent; in 32 cases of 11 to 1,000 trichinae per gram, 100 percent.

Since it is evident that increasing age increases the time factor which operates in the production of calcification, as opposed to the factor of intensity of infestation, the possibility that the age factor might be the explanation for the total lack of calcification in light infestations and for the constant presence of calcification in heavy infestations, must be considered. From table 3 it appears that infestations with less than 1 trichina per gram occur in all the 10 decades except the ninth, and never show calcification; infestations with 1 to 10 trichinae per gram occur in every decade from the third through the ninth, with 83 percent calcified, and with at least 70 percent calcified in every decade in which they are present; infestations with 11 to 1,000 trichinae per gram occur in all decades from the third through the tenth, with 100 percent of cases calcified. Of the 87 cases in the intermediate group, with 1 to 10 trichinae per gram, the 14 uncalcified cases are distributed as follows: Third decade, 2; fourth decade, 3; fifth decade, 3; sixth decade, 3; seventh decade, 2; eighth decade, 1. Apparently calcification can be more definitely correlated with intensity of infestation than with age, since light cases, always found uncalcified, occur in almost all decades, heavy cases, always found calcified, in almost all decades, and intermediate infestations, both calcified and uncalcified, in almost all decades, precisely the results to be expected from the operation of an intensity factor. On the other hand, light infestations are never calcified in any decade, or heavy infestations uncalcified in any decade, whereas light ones should be calcified in later decades, and heavy ones uncalcified in earlier decades, if the age factor were the determinant for calcification regardless of intensity of infestation.

The possibility that there is a group of cases of the intensity of less than 1 trichina per gram, with the trichinae calcified, which would not be detected with our routine technique, is still evident, and is one that we are investigating by a suitable technique. However, if we assume that we shall find as many cases of this intensity that are calcified as we have found uncalcified, the percentages from light through intermediate to heavy infestations will be of the order of 50, 83, and 100 percent, or still of the order of increasing calcification proportional to increasing intensity of infestation. The theory and the data are still in line with the known findings of pathology, to the effect that the mobilization of defense and healing processes are usually roughly proportional to the intensity of attack on and injury to a host organism. At this time we conclude only that our data still sustain the theory, leaving it to further findings to establish or disprove the theory.

With rather complete clinical records for all of our 174 positive cases, we had hoped to be able to correlate our findings on intensity of infestation with clinical symptoms. However, not one of our cases had a clinical history of trichinosis, and this is true also for all of the

198 positive cases recorded in incidence studies in the literature which we have already mentioned. That some of our cases with heavy infestations developed more or less typical clinical trichinosis can not be doubted, and probably there was clinical trichinosis, perhaps atypical, in those with more moderate infestations. There is a large body of published data relating to cases of trichinosis that have come to necropsy, but unfortunately there is almost a complete lack of quantitative data as to the numbers of trichinae found in specified amounts of muscle examined. The few that have come to our attention are as follows:

Smith (*4*) records 9 cases of trichinosis, with 5 deaths. In one case almost 200,000 trichinae per cubic inch were found at necropsy (i. e., approximately 12,800 per gram).

Wislizenus (*5*) records 5 cases, a mother, 3 children of 8, 10, and 12 years, and a hired man. An 8-year old child died, and at necropsy the gastrocnemius showed as many as 100 trichinae in a piece the size of a pinhead.

Coupland (*6*) mentions finding many trichinae in the muscles of a case at necropsy. In 1 grain of thigh muscle there were 180 cysts (i. e., approximayely 2,700 per gram). He makes a rough estimate of 75,000,000 worms in the entire body.

Partridge (*7*) records 14 cases, with 2 deaths. The necropsies were positive, with as many as 13 trichinae in one-tenth grain of flesh (i. e., approximately 1,950 per gram).

Rau (*8*) records 4 cases in one family, with 2 deaths, those of the mother and a 13-year old daughter. Large numbers of trichinae were found in both at necropsy. He estimates that the daughter had 30,000 to 100,000 trichinae per cubic inch (i. e., approximately 1,918 to 6,393 per gram), and the mother 3,000 to 26,000 trichinae per cubic inch (i. e., approximately 192 to 1,665 per gram). The method of estimating the number per cubic inch is not given. He states that the deltoid muscle of the daughter was examined microscopically, and was found heavily infested, showing 12 to 18, and, in some parts, 42 trichinae to a field view. In the mother, the deltoid showed 3 to 9, the rectus femoris 2 to 6, and the diaphragm 1 to 3 trichinae to a microscope field. The field of the microscope, using an A eyepiece and an 8/10 objective, is specified as 0.5 mm.

Sears (*9*) mentions finding on biopsy 13 trichinae in the gastrocnemius in one field.

Bloch (*10*) states that, in the biopsy of a case that recovered, the biceps showed up to 10 trichinae per low power field; in another case (*11*), there were as many as 12 unencapsulated trichinae in a piece of muscle about 2 mm square examined with low power.

Chandler (*12*), as noted by Hall and Collins (*1*), reports a fatal case in which the number present was "even greater" than a little over 900 trichinae per gram.

These data are too incomplete and unsatisfactory to permit of statistical treatment leading to any valid conclusions. Even if we had more specific data covering the numbers of trichinae in muscles, our conclusions necessarily would have to be conditioned by a number of variable factors. It is clear that any single figure, based on intensity of infestation in any one set of muscles, has only limited application, and in the cases cited different muscles are involved. It is also clear that there must be a fairly wide range in the tolerance of different individuals to infestations with trichinae. However, by disregarding these considerations and reducing the above estimates wherever possible to number of trichinae per gram of muscle, it would appear that in the fatal cases there have been from approximately 1,000 larvae per gram of muscle (*12*) or 192 to 1,665 per gram (*8*), up to 12,800 per gram (*4*). Our own results indicate that an infestation with nearly 1,000 larvae per gram may not be fatal.

It is unsafe to draw conclusions from so few data, especially with so many variables in muscles involved, resistance of patient, the possibility that some cases represent repeated infections rather than 1 infection, and other factors, but the possibility that 1,000 larvae per gram of diaphragm might be near the upper limit of infestations which can be survived is tentatively suggested for consideration as relevant data become available in the future. This suggestion is based on our findings of 2 cases surviving infestations with almost 1,000 per gram and the above data on fatal cases showing from approximately 1,000 per gram (*12*), less than 2,000 per gram (*8*), less than 3,000 per gram (*6*), less than 7,000 per gram (*8*), and over 12,000 per gram (*4*). On these meager data we initiate a search for some approximate upper limit of infestation that may be survived, and for the lower limit of infestation which is always, or almost always, fatal. Tentatively, and as a basis for more critical consideration of the subject in the future, we suggest the following designations for our groupings in table 2: Less than 1 trichina per gram of diaphragm muscle, "very light;" 1 to 10, "light;" 11 to 50, "very moderate;" 51 to 100, "moderate;" 101 to 500, "heavy;" 501 to 1,000, "severe;" and over 1,000, "critical." It is not intended to mean that 1 trichina more or less shifts a case from one bracket to another, but to outline tangibly groups that may be used as a basis for further study, and to invite attention to the possible clinical implications of the quantitative data.

INCIDENCE IN INSTITUTIONALIZED MENTALLY DERANGED PATIENTS

Slightly more than a fifth of our diaphragms (205) came from St. Elizabeths Hospital in Washington. The patients of this hospital are all mental cases, and the period of hospitalization is commonly much longer than in the other hospitals from which we received material. In addition, there is available a considerable body of data regarding the patients. The results we have obtained from these cases appear to be significant in several respects. We shall consider here only their bearing on the incidence of trichinae in the population as a whole and, incidentally, on the longevity of the worms.

Of the 205 cases, 27, or 13.2 percent, were positive. This is lower than the 17.4 percent found for the entire series. The patients appear to represent, proportionally, the same racial and economic groups as the remainder of the series.

The data regarding length of hospitalization as correlated with incidence may be summarized as follows:

Length of hospitalization	Less than 1 year	1 to 5 years	Over 5 years
Total number of cases examined	59	66	80
Percentage positive for trichinae	16 9	13 6	10 0

Although the numbers are too small to be statistically significant, the consistency of the drop in the percentage of positive cases as the length of hospitalization increases, 16.9, 13.6, and 10.0, suggests that there is reality in the relationship to the time in the hospital, and that the low incidence in patients hospitalized for more than 5 years may be correlated with hospitalization under conditions limiting the consumption of pork to pork which is adequately cooked. Moreover, the incidence in patients hospitalized for less than one year is close to that found for the series as a whole, suggesting strongly that the mental condition of the patients is of little or no significance as regards any low incidence. Insanity is usually associated with increased parasitism.

The inclusion of hospitalized mentally deranged, to the extent of over 20 percent of our cases, overloads our sample far beyond the proportion in which this group is present in the general population. The removal of this low-incidence group from our total results in showing an incidence of 18.6 percent for our group of persons not hospitalized for mental conditions. However, a true incidence figure would cover these hospitalized cases in their proportion to the total population, and our general incidence for 1,000 cases could evidently be shifted by increasing or decreasing its content of high- or low-incidence groups. As it stands, this low-incidence group is more or less balanced by some high-incidence groups.

The distribution of the 27 positive cases according to the nature of the infestations, whether with live, mixed, or dead trichinae, yields also data bearing on the subject of longevity of trichinae. Using the same time groupings as above, we have the following:

Length of hospitalization	Less than 1 year	1 to 5 years	Over 5 years	Totals for all cases
Live infestations	3	3	0	6
Mixed infestations	2	3	2	7
Dead infestations	5	3	6	14

Infestations with live trichinae only are present in patients with relatively short periods of hospitalization; and, although there are 6 such cases in those hospitalized up to 5 years, there are no such cases after 5 years. A similar finding is obtained when the average hospitalization of patients with the 3 types of infestation is considered, the data showing the following:

Average hospitalization, with live infestations: 1 year, 10 months. Average hospitalization, with mixed infestations: 4 years, 11 months. Average hospitalization, with dead infestations: 7 years, 6 months.

Although the number of our positive cases is still too small to warrant any positive conclusions, some further speculations on longevity of the organism are suggested by our data in connection with the fact that the chance of infection during the period of hospitalization is very slight. Although infestations with only live trichinae present in the diaphragm occur in our series only during the first 5 years of hospitalization, live worms are present in mixed infestations with live and dead trichinae for a longer period. Of the two such cases in our series, one is in a patient hospitalized for 7 years, and the other in a patient hospitalized for 19 years and with 6 trichinae per gram. As this latter case appears to indicate that trichinae may survive for 19 years, the possibility of infection from outside sources during the period of hospitalization was investigated for this case. Dr. S. A. Silk, clinical director of the hospital, was kind enough to check the records for this patient, and he has written us as follows:

"This patient during his entire residence here was restricted to a ward, never having had ground parole, nor was he ever away from the institution on visits. At various times he performed light work in the dairy and other hospital establishments, but it is unlikely that he ate any food other than that furnished by the institution, since he had no funds to his credit here which he could have used for the purchase of any luxuries; nor did any relatives or friends ever visit him here. As he always worked under supervision he could not have wandered away from the hospital for even a few minutes."

This case may be interpreted in at least two possible ways, as follows: (1) It represents an infestation acquired before entering hospital, and correctly indicates that trichinae may live for at least 19 years; or (2) it represents an infestation acquired before entering hospital and still present as dead trichinae, plus a superimposed second infestation acquired since entering hospital and still present as live trichinae, and hence throws no light on the matter of longevity. It might be urged against the first interpretation that it runs somewhat counter to our other findings to the effect that the rapidity with which trichinae die and calcify is somewhat proportional to the degree of infestation, and that even with what we have termed a "light" infestation of this order we might expect death and calcification of trichinae to occur in less than 19 years; on the other hand, death and calcification are conditioned, in part, by such factors as food, calcium, vitamins, and tissue reactions, quite aside from a simple time factor, and this patient may have had unusual conditions in these respects. It might be urged against the second interpretation that it presupposes a flaw in the cooking of pork at the hospital or in the matter of the patient's access to food not cooked at the hospital, which seems unlikely; on the other hand, individual failures in the preparation of food, and improbable conduct and achievements on the part of insane patients, cannot be ruled out entirely. A longevity of 19 years for trichinae is in line with much that we find in the literature, but the evidence for such longevity, so far as we have seen it, is definitely unconvincing; it is based on such things as the finding of live trichinae at necropsy, with a history of clinical trichinosis many years previously, in a patient whose food habits were unsupervised and who was known to have eaten raw or undercooked pork in acquiring trichinosis, and such findings do not eliminate the possibility of later superimposed infections. As an isolated observation, our case is presented as a matter of record, with no selection of the alternative interpretations at this time.

SUMMARY

In the examination of diaphragms of 1,000 necropsy cases, 174 were found infested with trichinae, an incidence of 17.4 percent.

A preliminary report on the first 300 of our series of 1,000 diaphragms was made by Hall and Collins (*1*). The present study is based on the total of the 300 diaphragms reported by Hall and Collins and 700 additional diaphragms examined by the present authors.

Of the 1,000 cases, 824 cases, with 137 positive for trichinae, were from 10 hospitals in Washington, D. C.; 110 cases, with 24 positive for trichinae, were from the United States Marine Hospital, Baltimore, Md.; 66 cases, with 13 positive for trichinae, were from the United States naval hospitals at Philadelphia, Pa., Chelsea, Mass., Brooklyn, N. Y., and Portsmouth, Va.

Both the direct microscopic method and the digestion-Baermann method were used in the examinations of the diaphragms, and the results are recorded in number of trichinae per gram of muscle. Of 174 positive cases, there were 80 cases with dead trichinae only, 60 cases with live trichinae only, and 34 cases with both live and dead trichinae. Light infestations, up to 10 trichinae per gram, predominated over heavier infestations, the largest group, 50 percent of the total, being in the range from 1 to 10 trichinae per gram, and the next largest, 31.6 percent of the total being in the range of less than 1 per gram. Infestations with over 10 per gram made up 18.4 percent of the total positive cases.

The theory that the rapidity of the death and calcification of trichinae is more or less proportional to the intensity of infestation is still sustained by our data, without yet being conclusively established.

The incidence of trichinae in the mentally deranged shows that the incidence in patients hospitalized for less than 1 year is close to that found for the total series of 1,000 cases, and as length of hospitalization increases, the percentage of positive cases decreases. Apparently the mental condition of the patients is of little significance as regards a low incidence with trichinae, and apparently the average incidence is below that of our series of 1,000 cases because of the long periods of hospitalization with food properly cooked, thereby shortening the period of exposure to trichinae and diminishing the chance of infection.

The findings from the present study provide confirmation of the findings in the earlier study of Hall and Collins (*1*). The higher incidence obtained is probably more accurate for the groups involved, as it rests on a much broader statistical basis; but any incidence obtained would vary more or less with an increase or decrease in the size of population groups of relatively high or relatively low incidence in our total sample. The general incidence for the United States will have to be ascertained in other ways, and we are carrying out a study that will give more precise information, but the known facts clearly indicate that the problem of trichinosis and its control is one of national concern.

REFERENCES

(*1*) Hall, Maurice C., and Collins, Benjamin J.: Studies on trichinosis. I. The incidence of trichinosis as indicated by post-mortem examination of 300 diaphragms. Pub. Health Rep., 52: 468–490 (April 16, 1937).

(*2*) Magath, Thomas B.: Encysted trichinae; their incidence in a private practice and the bearing of this on the interpretation of diagnostic tests. J. Am. Med. Assoc., 108: 1964–1967 (June 5, 1937).

(*3*) Glazier, W. C. W.: Report on trichinae and trichinosis. Prepared under the direction of the Supervising Surgeon General, U. S. Marine Hospital Service. U. S. Government Printing Office, Washington, D. C. 1881.

(*4*) Smith, E. M.: The Trichina spiralis. Chicago Med. J., 23: 337–341 (August 1866).

(*5*) Wislizenus, A.: Trichinosis and trichiniasis. St. Louis Med. and Surg. J., n. s. 11: 243–250 (May 1874).

(*6*) Coupland, Sidney: Specimens of muscles from a case of trichiniasis. Tr. Path. Soc. Lond., **25:** 262–263 (1874).
(*7*) Partridge, J. M.: Pathology and diagnosis of trichiniasis. N. Y. M. Times, **9:** 140–141 (August 1881).
(*8*) Rau, E. A.: Report on a fatal outbreak of trichiniasis at Bethlehem. 2nd Ann. Rept. State Board of Health of Pennsylvania (1886). Pages 109–113. (1887).
(*9*) Sears, G. R.: A case of trichinosis. Boston Med. and Surg. J., **144:** 523 (May 30, 1901).
(*10*) Bloch, L.: Trichinosis. Report of a case with the trichina larvae in the spinal fluid. J. Am. Med. Assoc., **65:** 2140–2141 (Dec. 18, 1915).
(*11*) Bloch, L.: Report of a series of cases of trichinosis, with remarks on diagnosis. Ill. Med. J., **29:** 369–373 (May 1916).
(*12*) Chandler, A. C.: Animal Parasites and Human Disease. John Wiley and Sons. 1926.

DEATHS DURING WEEK ENDED APRIL 9, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Apr. 9, 1938	Corresponding week, 1937
Data from 86 large cities in the United States:		
Total deaths	8,518	9,381
Average for 3 prior years	9,098	
Total deaths, first 14 weeks of year	121,328	142,237
Deaths under 1 year of age	511	601
Average for 3 prior years	612	
Deaths under 1 year of age, first 14 weeks of year	7,583	8,777
Data from industrial insurance companies:		
Policies in force	69,667,068	69,037,691
Number of death claims	13,403	14,876
Death claims per 1,000 policies in force, annual rate	10.0	11.2
Death claims per 1,000 policies, first 14 weeks of year, annual rate	10.1	11.5

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (------) indicate that cases or deaths may have occurred, although none was reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Apr. 16, 1938, and Apr. 17, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Apr. 16, 1938	Week ended Apr. 17, 1937	Week ended Apr. 16, 1938	Week ended Apr. 17, 1937	Week ended Apr. 16, 1938	Week ended Apr. 17, 1937	Week ended Apr. 16, 1938	Week ended Apr. 17, 1937
New England States:								
Maine	2	0	19	10	114	9	0	0
New Hampshire	0	0	-------	-------	18	73	0	0
Vermont	0	3	-------	-------	67	1	0	0
Massachusetts	6	2	-------	-------	317	714	2	9
Rhode Island	0	2	1	-------	-------	211	0	1
Connecticut	5	1	4	9	46	517	0	0
Middle Atlantic States:								
New York	34	45	[1] 5	[1] 23	3,769	1,073	10	16
New Jersey	15	14	11	5	977	2,582	2	5
Pennsylvania	33	33	-------	-------	5,932	737	7	15
East North Central States:								
Ohio	12	21	-------	147	2,904	900	3	14
Indiana	15	9	5	24	1,090	203	0	5
Illinois	23	30	23	33	3,412	209	3	8
Michigan [2]	7	11	2	7	4,027	84	4	4
Wisconsin	7	3	29	60	2,521	24	0	1
West North Central States:								
Minnesota	2	8	1	-------	121	20	1	1
Iowa	2	10	-------	2	196	9	2	0
Missouri	15	20	48	103	711	81	0	1
North Dakota	0	0	13	22	42	-------	0	1
South Dakota	1	1	-------	-------	-------	-------	1	1
Nebraska	0	1	-------	-------	100	70	1	0
Kansas	8	3	18	6	662	42	1	0
South Atlantic States:								
Delaware	2	2	-------	-------	31	60	0	0
Maryland [2]	11	7	5	15	56	737	1	4
District of Columbia	2	4	2	-------	19	94	1	3
Virginia	11	10	-------	-------	835	668	4	19
West Virginia	7	17	28	51	507	53	6	9
North Carolina	11	19	7	77	2,582	248	2	2
South Carolina	3	2	181	429	253	41	0	0
Georgia [3]	6	9	-------	247	305	-------	1	4
Florida	4	9	2	-------	364	-------	3	18

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Apr. 16, 1938, and Apr. 17, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Apr. 16, 1938	Week ended Apr. 17, 1937	Week ended Apr. 16, 1938	Week ended Apr. 17, 1937	Week ended Apr. 16, 1938	Week ended Apr. 17, 1937	Week ended Apr. 16, 1938	Week ended Apr. 17, 1937
East South Central States:								
Kentucky	16	5	12	34	526	315	5	13
Tennessee	6	6	41	154	300	18	1	2
Alabama [3]	10	11	80	365	693	11	3	15
Mississippi [2]	6	5					2	1
West South Central States:								
Arkansas	11	1	69	82	205		0	1
Louisiana	5	13	7	26	15	7	0	2
Oklahoma [4]	7	8	127	133	146	61	0	3
Texas	83	42	358	763	535	1,011	1	6
Mountain States:								
Montana	1	2		7	16		0	1
Idaho	1	3	7	88	16	24	0	2
Wyoming	0	0			46	2	0	0
Colorado	9	10			435	7	0	1
New Mexico	4	1	4	1	100	80	0	1
Arizona	2	1	53	30	40	186	0	1
Utah [2]	6	0			374	23	1	0
Pacific States:								
Washington	4	0		1	18	54	0	1
Oregon [5]	8	0	55	39	43	7	0	0
California	80	15	40	258	541	211	1	1
Total	398	419	1,257	3,201	36,126	11,430	69	192
First 15 weeks of year	8,547	7,637	37,297	262,793	488,032	104,153	1,295	2,539

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended Apr. 16, 1938	Week ended Apr. 17, 1937	Week ended Apr. 16, 1938	Week ended Apr. 17, 1937	Week ended Apr. 16, 1938	Week ended Apr. 17, 1937	Week ended Apr. 16, 1938	Week ended Apr. 17, 1937	Week ended Apr. 16, 1938
New England States:									
Maine	0	1	15	25	0	0	3	1	57
New Hampshire	0	0	7	14	0	0	0	0	6
Vermont	0	0	13	9	0	1	0	0	8
Massachusetts	0	0	428	308	0	0	0	1	86
Rhode Island	0	0	18	56	0	0	0	0	0
Connecticut	0	0	133	177	0	0	0	0	46
Middle Atlantic States:									
New York	0	3	1,065	1,034	0	1	5	8	418
New Jersey	0	0	100	211	0	0	1	2	88
Pennsylvania	0	1	625	1,077	0	0	7	8	305
East North Central States:									
Ohio	0	1	389	419	13	2	0	7	235
Indiana	0	0	117	218	61	14	3	1	28
Illinois	2	1	565	835	33	60	4	4	96
Michigan [2]	0	2	481	720	13	13	1	6	253
Wisconsin	1	0	164	289	7	12	1	4	192
West North Central States:									
Minnesota	0	2	113	103	12	13	0	0	27
Iowa	1	0	204	287	46	48	2	3	27
Missouri	0	0	178	478	23	47	3	3	22
North Dakota	0	0	17	16	16	13	0	0	21
South Dakota	0	0	10	63	9	2	0	1	16
Nebraska	0	0	36	62	3	8	1	1	4
Kansas	0	1	153	401	45	37	1	0	92
South Atlantic States:									
Delaware	0	0	12	11	0	0	0	1	12
Maryland [2]	0	0	63	50	0	0	1	0	44
District of Columbia	0	1	26	21	0	0	2	2	7
Virginia	0	0	41	19	0	0	2	2	122

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Apr. 16, 1938, and Apr. 17, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended Apr. 16, 1938	Week ended Apr. 17, 1937	Week ended Apr. 16, 1938	Week ended Apr. 17, 1937	Week ended Apr. 16, 1938	Week ended Apr 17, 1937	Week ended Apr. 16, 1938	Week ended Apr. 17, 1937	Week ended Apr. 16, 1938
South Atlantic States—Con									
West Virginia	0	3	24	56	0	0	1	4	65
North Carolina	0	0	33	28	1	0	2	3	415
South Carolina	0	1	6	3	0	0	0	4	55
Georgia [3]	0	0	8	6	1	0	3	8	76
Florida	0	0	6	15	4	0	3	5	2
East South Central States·									
Kentucky	0	1	45	57	16	2	2	4	47
Tennessee	2	1	24	25	2	0	2	6	36
Alabama [3]	1	1	15	7	0	0	0	2	60
Mississippi [2]	1	2	1	7	1	0	5	5	--------
West South Central States:									
Arkansas	1	0	3	3	4	0	7	0	25
Louisiana	1	0	6	12	0	0	6	13	9
Oklahoma [4]	1	0	19	33	17	7	1	1	90
Texas	1	2	118	208	32	11	7	15	303
Mountain States:									
Montana	0	0	18	39	10	9	0	1	37
Idaho	0	0	8	21	21	7	0	1	18
Wyoming	0	0	7	14	2	4	0	0	6
Colorado	0	0	43	33	6	15	1	0	35
New Mexico	0	0	14	29	0	0	0	1	20
Arizona	0	0	11	16	2	0	1	0	69
Utah [2]	0	0	40	18	0	0	0	0	27
Pacific States·									
Washington	0	0	34	15	27	6	0	2	128
Oregon [5]	0	1	53	35	20	15	0	1	11
California	2	4	181	213	85	18	5	4	446
Total	14	29	5, 690	7, 859	532	365	83	130	4, 192
First 15 weeks of year	307	323	90, 774	103, 233	8, 171	4, 698	1, 777	1, 644	62, 360

[1] New York City only.
[2] Period ended earlier than Saturday.
[3] Typhus fever, week ended Apr. 16, 1938, 7 cases as follows: Georgia, 5; Alabama, 2.
[4] Figures for 1937 are exclusive of Oklahoma City and Tulsa.
Rocky Mountain spotted fever, week ended Apr. 16, 1938, Oregon, 1 case.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
March 1938										
Alabama	31	40	659	59	4, 367	19	4	54	4	12
Arkansas	6	36	555	107	1, 423	31	2	34	31	19
Colorado	2	58	169	--------	2, 922	--------	1	274	39	6
Idaho	0	3	39	--------	6	--------	2	87	48	5
Indiana	8	135	74	--------	4, 245	--------	2	668	173	8
Iowa	6	17	43	--------	678	--------	2	1, 144	171	4
Maine	0	17	28	--------	879	--------	0	72	0	6
Massachusetts	9	17	--------	--------	1, 258	--------	0	1, 712	0	3
Michigan	5	49	5	1	22, 151	--------	2	2, 822	53	26
Minnesota	1	10	16	2	481	--------	2	716	93	6
Missouri	7	70	393	33	4, 045	--------	0	924	205	13
New Jersey	3	60	97	1	5, 745	--------	1	672	0	8
New Mexico	0	26	32	--------	423	5	0	103	1	6
Vermont	0	4	--------	--------	678	--------	2	80	0	0

Summary of monthly reports from States—Continued

March 1938	Cases
Chickenpox:	
Alabama	245
Arkansas	64
Colorado	382
Idaho	70
Indiana	389
Iowa	455
Maine	282
Massachusetts	1,943
Michigan	2,726
Minnesota	862
Missouri	340
New Jersey	3,600
New Mexico	178
Vermont	165
Colorado tick fever:	
Colorado	1
Conjunctivitis:	
Idaho	11
Dengue:	
Alabama	1
Dysentery:	
Arkansas (bacillary)	1
Colorado (amoebic)	2
Michigan (amoebic)	3
Michigan (bacillary)	2
Minnesota (bacillary)	1
Missouri	5
NewJersey (amoebic)	1
Encephalitis, epidemic or lethargic:	
Alabama	1
Arkansas	1
Colorado	1
Michigan	2
Missouri	4
New Jersey	3
German measles:	
Alabama	40
Idaho	4
Iowa	8
Maine	10
Massachusetts	92
Michigan	305
New Jersey	121
New Mexico	1
Vermont	21
Hookworm disease:	
Arkansas	1
Jaundice, infectious:	
Michigan	1

March 1938—Continued	Cases
Mumps:	
Alabama	187
Arkansas	43
Colorado	79
Idaho	185
Indiana	88
Iowa	126
Maine	94
Massachusetts	1,321
Michigan	1,654
Missouri	376
New Jersey	1,492
New Mexico	41
Vermont	634
Ophthalmia neonatorum:	
Alabama	2
Arkansas	4
Colorado	1
Massachusetts	74
New Jersey	30
New Mexico	1
Paratyphoid fever:	
Colorado	2
Massachusetts	8
Puerperal septicemia:	
New Mexico	1
Rabies in animals:	
Alabama	85
Arkansas	23
Indiana	51
Massachusetts	8
Michigan	4
Missouri	9
New Jersey	20
New Mexico	3
Rocky Mountain spotted fever:	
Colorado	1
Septic sore throat:	
Arkansas	1
Colorado	15
Idaho	10
Iowa	16
Massachusetts	28
Michigan	33
Minnesota	14
Missouri	53
New Jersey	27
New Mexico	12

March 1938—Continued	Cases
Tetanus:	
Alabama	6
Massachusetts	1
Michigan	1
Trachoma:	
Arkansas	10
Idaho	2
Indiana	1
Michigan	2
Missouri	59
New Jersey	1
Trichinosis:	
Massachusetts	5
Michigan	4
Minnesota	3
Tularaemia:	
Alabama	1
Arkansas	6
Michigan	1
Minnesota	1
Missouri	1
Typhus fever:	
Alabama	3
Undulant fever:	
Alabama	1
Indiana	2
Iowa	14
Maine	2
Massachusetts	4
Michigan	20
Minnesota	4
New Jersey	5
New Mexico	1
Vermont	3
Vincent's infection:	
Idaho	2
Maine	12
Michigan	13
Whooping cough:	
Alabama	127
Arkansas	144
Colorado	90
Idaho	78
Indiana	94
Iowa	115
Maine	246
Massachusetts	572
Michigan	1,067
Minnesota	140
Missouri	197
New Jersey	818
New Mexico	199
Vermont	123

CASES OF VENEREAL DISEASES REPORTED FOR FEBRUARY 1938

These reports are published monthly for the information of health officers in order to furnish current data as to the prevalence of the venereal diseases. The figures are taken from reports received from State and city health officers. They are preliminary and are therefore subject to correction. It is hoped that the publication of these reports will stimulate more complete reporting of these diseases.

Reports from States

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Alabama	1,790	6.18	287	0.99
Arizona [1]				
Arkansas	958	4.68	325	1.59
California	1,755	2.85	1,185	1.93
Colorado	23	.21	14	.13
Connecticut	194	1.12	97	.56
Delaware	289	11.07	46	1.76
District of Columbia	222	3.54	144	2.30
Florida [2]	2,189	13.11	285	1.71
Georgia	2,104	6.82	347	1.12
Idaho	42	.85	31	.63
Illinois	1,757	2.23	1,041	1.82

See footnotes at end of table.

Reports from States—Continued

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Indiana	357	1.03	118	0.34
Iowa	280	1.10	252	.99
Kansas	230	1.23	102	.55
Kentucky	776	2.66	342	1.17
Louisiana	636	2.98	88	.41
Maine	61	.71	40	.47
Maryland	977	5.82	239	1.42
Massachusetts	461	1.04	445	1.01
Michigan	1,290	2.67	593	1.23
Minnesota	263	.99	190	.72
Mississippi	2,266	11.20	2,447	12.10
Missouri	573	1.44	121	.30
Montana [2]	70	1.30	13	.24
Nebraska	67	.49	86	.63
Nevada	26	2.57	2	.02
New Hampshire	40	.78	40	.78
New Jersey	891	2.05	266	.61
New Mexico	115	2.73	26	.62
New York	3,597	2.78	1,793	1.38
North Carolina	3,803	1.09	583	1.67
North Dakota	37	.52	31	.41
Ohio	1,484	2.20	419	.62
Oklahoma	429	1.68	287	1.13
Oregon	84	.82	114	1.11
Pennsylvania [3]	1,606	1.58	337	.33
Rhode Island	105	1.54	37	.54
South Carolina [1]	----------	----------	----------	----------
South Dakota	38	.55	21	.30
Tennessee	1,199	4.14	422	1.46
Texas [1]	----------	----------	----------	----------
Utah	27	.52	30	.58
Vermont	10	.26	17	.44
Virginia	1,055	3.90	324	1.20
Washington	321	1.94	240	1.45
West Virginia [2]	452	2.42	145	.78
Wisconsin	41	.14	161	.55
Wyoming [4]	12	.51	3	.13
Total	35,002	2.90	14,176	1.17

Reports from cities of 200,000 population or over

Akron, Ohio [1]	----------	----------	----------	----------
Atlanta, Ga	355	12.37	130	4.53
Baltimore, Md	555	6.73	144	1.75
Birmingham, Ala	247	8.75	62	2.20
Boston, Mass	166	2.10	166	2.10
Buffalo, N. Y	191	3.23	63	1.06
Chicago, Ill	971	2.72	712	2.00
Cincinnati, Ohio [1]	----------	----------	----------	----------
Cleveland, Ohio [1]	----------	----------	----------	----------
Columbus, Ohio	90	2.94	24	.79
Dallas, Tex	349	12.05	72	2.49
Dayton, Ohio	63	3.00	16	.76
Denver, Colo	8	.27	3	.10
Detroit, Mich	591	3.41	278	1.61
Houston, Tex. [5]	174	5.20	55	1.64
Indianapolis, Ind	24	.64	35	.93
Jersey City, N. J	11	.34	0	----------
Kansas City, Mo	106	2.52	8	.19
Los Angeles, Calif	618	4.32	381	2.66
Louisville, Ky	398	12.28	123	3.80
Memphis, Tenn	357	13.37	56	2.10
Milwaukee, Wis. [6]	----------	----------	----------	----------
Minneapolis, Minn	87	1.79	57	1.17
Newark, N. J	342	7.38	148	3.19
New Orleans, La	45	.94	25	.52
New York, N. Y	2,202	3.10	1,324	1.81
Oakland, Calif	32	1.06	28	.92

See footnotes at end of table.

Reports from cities of 200,000 population or over—Continued

	Syphilis		Gonorrhea	
	Case reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Omaha, Nebr	29	1.32	15	0.68
Philadelphia, Pa	473	2.38	------	------
Pittsburgh, Pa	205	3.00	26	.38
Portland, Oreg	55	1.75	73	2.33
Providence, R. I	56	2.16	20	.77
Rochester, N. Y	43	1.28	39	1.16
St. Louis, Mo	253	3.03	98	1.17
St. Paul, Minn	20	.71	15	.53
San Antonio, Tex	117	4.65	66	2.63
San Francisco, Calif	148	2.21	152	2.27
Seattle, Wash	175	4.61	155	4.08
Syracuse, N. Y	57	2.62	37	1.70
Toledo, Ohio [1]	------	------	------	------
Washington, D. C. [7]	222	3.54	144	2.30

[1] No report for current month.
[2] Incomplete.
[3] Only cases of syphilis in the infectious stage are reported.
[4] From report submitted to medical director of epidemiological studies.
[5] Reported by Jefferson Davis Hospital.
[6] No report during present fiscal year.
[7] Reported by social hygiene clinic.

WEEKLY REPORTS FROM CITIES

City reports for week ended Apr. 9, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	188	327	92	7,311	846	2,582	26	415	23	1,413	------
Current week [1]	123	89	30	11,505	625	1,966	22	393	18	1,202	------
Maine:											
Portland	0	------	0	11	1	0	0	0	1	10	21
New Hampshire:											
Concord	0	------	0	0	2	3	0	0	0	0	8
Manchester	0	------	0	0	4	5	0	0	0	0	20
Nashua	0	------	0	0	1	0	0	0	0	0	7
Vermont:											
Barre	0	------	0	0	0	0	0	1	0	0	2
Burlington	0	------	0	4	0	0	0	0	0	0	10
Rutland	0	------	0	0	2	0	0	0	0	0	10
Massachusetts:											
Boston	0	------	1	216	20	131	0	10	0	25	206
Fall River	0	------	0	2	1	1	0	2	0	4	23
Springfield	0	------	0	7	0	9	0	2	0	6	46
Worcester	0	------	0	2	7	25	0	2	0	6	51
Rhode Island:											
Pawtucket	0	------	0	1	0	0	0	0	0	0	16
Providence	0	------	0	0	11	19	0	2	0	19	65
Connecticut:											
Bridgeport	0	------	0	0	1	18	0	0	0	0	36
Hartford	0	------	0	3	8	23	0	3	1	0	48
New Haven	0	1	0	3	1	3	0	4	0	13	34
New York:											
Buffalo	------	0	1	7	16	74	0	7	0	8	143
New York	31	13	3	1,993	150	447	0	87	3	218	1,552
Rochester	0	------	0	3	7	16	0	4	1	4	73
Syracuse	1	------	0	32	2	11	0	1	0	0	34

[1] Figures for Springfield, Illinois, estimated; report not received.

City reports for week ended Apr. 9, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
New Jersey:											
Camden	2	1	1	28	1	6	0	0	1	0	41
Newark	1	------	1	17	10	17	0	7	0	35	126
Trenton	0	------	0	2	1	2	0	2	0	2	42
Pennsylvania:											
Philadelphia	2	1	2	832	43	148	0	29	0	23	489
Pittsburgh	6	1	0	119	12	23	0	5	0	22	137
Reading	0	------	2	16	1	2	0	0	0	7	43
Scranton	0	------	------	44	------	1	0	------	0	0	------
Ohio:											
Cincinnati	0	------	1	8	12	12	0	5	0	7	140
Cleveland	8	12	1	342	15	60	0	11	0	55	184
Columbus	2	------	0	151	7	5	2	0	0	2	87
Toledo	0	------	0	114	4	5	5	2	0	10	61
Indiana:											
Anderson	0	------	0	131	0	3	1	0	0	0	10
Fort Wayne	0	------	0	70	4	7	0	0	0	2	30
Indianapolis	5	------	0	253	12	24	2	5	0	2	107
South Bend	0	------	0	28	4	6	0	0	0	0	20
Terre Haute	1	------	0	8	0	2	0	0	0	0	18
Illinois:											
Alton	0	------	0	0	1	6	0	0	0	0	15
Chicago	11	7	0	1, 669	34	257	2	39	1	48	690
Elgin	0	------	0	0	0	4	0	0	0	1	7
Moline	0	------	0	22	2	5	0	0	0	0	9
Springfield	------	------	------	------	------	------	------	------	------	------	------
Michigan:											
Detroit	4	2	0	2, 266	18	150	0	18	0	98	270
Flint	2	------	0	53	8	45	0	0	0	23	18
Grand Rapids	0	------	0	129	4	7	0	0	0	2	32
Wisconsin:											
Kenosha	0	------	0	28	0	3	0	0	1	1	10
Madison	0	------	0	50	1	3	0	0	0	7	13
Milwaukee	0	------	0	700	5	18	0	5	0	56	108
Racine	0	------	0	245	1	7	0	1	0	13	14
Superior	0	------	0	7	0	7	0	0	0	0	8
Minnesota:											
Duluth	0	------	0	2	0	1	0	0	0	8	20
Minneapolis	1	------	1	160	6	36	8	0	0	0	91
St. Paul	0	------	0	4	0	9	0	4	0	0	62
Iowa:											
Cedar Rapids	0	------	------	2	------	0	0	------	0	1	------
Davenport	0	------	------	3	------	0	0	------	0	0	------
Des Moines	0	------	0	12	0	33	0	0	0	2	21
Sioux City	0	------	------	0	------	2	0	------	0	4	------
Waterloo	2	------	------	100	------	6	0	------	0	0	------
Missouri:											
Kansas City	2	------	0	94	14	26	0	4	0	5	119
St. Joseph	0	------	0	33	3	1	0	1	0	0	32
St. Louis	9	------	0	5	9	86	2	5	0	2	220
North Dakota:											
Fargo	0	------	0	0	2	5	0	0	0	0	5
Grand Forks	0	------	------	67	------	0	0	------	0	0	------
Minot	0	------	0	0	0	0	2	0	0	1	4
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	3	------
Nebraska:											
Omaha	0	------	0	49	6	2	0	0	0	0	46
Kansas:											
Lawrence	0	2	0	8	0	1	0	0	0	1	1
Topeka	0	------	0	182	1	4	0	0	0	9	22
Wichita	0	------	0	9	2	4	0	1	0	3	23
Delaware:											
Wilmington	0	------	0	16	5	2	0	0	0	4	35
Maryland:											
Baltimore	2	2	0	19	15	34	0	9	2	36	192
Cumberland	0	------	0	2	1	1	0	0	0	0	10
Frederick	0	------	0	0	0	3	0	0	0	0	4
District of Columbia:											
Washington	3	1	0	27	13	23	0	10	1	13	152
Virginia:											
Lynchburg	1	------	0	0	1	0	0	0	0	2	6
Norfolk	0	------	0	40	3	6	0	1	0	0	24
Richmond	1	------	0	94	3	3	0	2	0	0	51
Roanoke	0	------	0	0	1	0	0	0	0	8	10

City reports for week ended Apr. 9, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
West Virginia:											
Charleston	0	------	0	8	2	0	0	1	0	0	23
Huntington	1	------	------	3	------	3	0	------	0	0	------
Wheeling	0	------	0	234	2	1	0	1	0	14	22
North Carolina:											
Gastonia	0	------	------	74	------	1	0	------	0	1	------
Raleigh	0	------	0	118	0	0	0	0	0	25	12
Wilmington	0	------	0	196	2	1	0	0	0	23	12
Winston-Salem	0	------	0	9	0	0	0	2	0	37	14
South Carolina:											
Charleston	0	8	0	16	3	1	0	1	0	0	17
Florence	0	------	0	11	0	0	0	0	0	0	8
Greenville	1	------	1	1	0	0	0	0	0	4	7
Georgia:											
Atlanta	0	5	0	27	9	3	0	6	0	5	88
Brunswick	0	------	0	16	0	0	0	0	0	0	5
Savannah	0	3	2	38	2	0	0	4	0	0	20
Florida:											
Miami	3	1	1	80	5	0	0	5	0	0	47
Tampa	4	1	1	17	1	2	0	2	0	0	20
Kentucky:											
Ashland	1	------	0	2	1	0	0	0	0	3	4
Covington	0	------	0	0	2	0	0	0	0	0	11
Lexington	0	------	0	3	1	0	0	2	0	0	18
Louisville	9	2	0	406	8	57	0	1	0	12	72
Tennessee:											
Knoxville	1	1	0	26	3	2	0	2	1	4	29
Memphis	2	------	1	57	4	2	0	3	1	2	66
Nashville	0	------	1	66	4	6	0	0	0	4	52
Alabama:											
Birmingham	0	5	0	121	4	3	0	4	0	0	69
Mobile	0	------	0	9	3	0	0	1	0	0	22
Montgomery	2	------	------	81	------	0	0	------	0	3	------
Arkansas:											
Fort Smith	1	------	------	3	------	1	0	------	1	1	------
Little Rock	0	------	0	14	5	0	0	1	0	5	7
Louisiana:											
Lake Charles	0	------	0	0	1	0	0	0	0	0	5
New Orleans	3	6	4	3	12	2	0	12	4	18	179
Shreveport	0	------	0	1	5	0	0	3	0	0	42
Oklahoma:											
Oklahoma City	0	------	2	2	2	2	0	0	0	0	33
Tulsa	1	------	------	92	------	2	6	------	0	7	------
Texas:											
Dallas	1	1	1	7	4	9	0	4	0	8	60
Fort Worth	0	------	0	2	4	4	1	3	0	3	46
Galveston	1	------	0	0	1	0	0	0	0	0	8
Houston	4	1	0	0	7	5	0	11	0	0	64
San Antonio	0	------	1	0	6	0	0	7	0	1	63
Montana:											
Billings	0	------	0	0	1	2	0	0	0	4	9
Great Falls	0	------	0	2	2	3	0	0	0	12	8
Helena	0	------	0	0	0	2	0	0	0	2	1
Missoula	0	1	1	0	1	0	0	0	0	0	6
Idaho:											
Boise	0	------	0	0	1	1	2	1	0	0	6
Colorado:											
Colorado Springs	0	------	0	1	2	0	0	1	0	1	16
Denver	4	------	0	226	9	12	0	7	0	4	90
Pueblo	0	------	0	0	1	1	0	0	0	4	7
New Mexico:											
Albuquerque	0	------	0	3	3	2	0	1	0	1	12
Utah:											
Salt Lake City	0	------	0	181	1	10	2	1	0	8	84
Washington:											
Seattle	0	------	1	0	4	3	1	6	0	59	92
Spokane	0	2	2	2	3	1	0	1	0	17	35
Tacoma	0	------	0	0	1	4	1	1	0	7	34
Oregon:											
Portland	1	1	0	19	7	20	0	1	1	3	76
Salem	0	1	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	14	13	1	32	21	53	0	16	1	34	363
Sacramento	0	------	0	13	0	4	0	2	0	50	31
San Francisco	0	2	0	1	10	7	0	7	0	53	177

City reports for week ended Apr. 9, 1938—Continued

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Connecticut:			
New Haven	2	0	0
New York:			
Buffalo	1	0	0
New York	1	0	4
Pennsylvania:			
Philadelphia	1	0	0
Ohio:			
Cleveland	2	3	0
Toledo	0	0	1
Indiana.			
Indianapolis	1	0	0
Illinois:			
Chicago	2	0	0
Michigan:			
Detroit	1	0	0
Maryland:			
Baltimore	1	0	0
Virginia:			
Richmond	1	1	0
Florida:			
Miami	1	0	0
Alabama:			
Birmingham	3	2	0
Louisiana:			
New Orleans	1	0	1
Shreveport	0	3	0
California:			
Los Angeles	1	1	0

Encephalitis, epidemic or lethargic.—Cases: New York, 3; Kansas City, Mo., 1.
Pellagra.—Cases. Baltimore, 3; Washington, 1; Atlanta, 3; Savannah, 2; Montgomery, 1.
Typhus fever.—Cases: Atlanta, 1; Tampa, 1; Mobile, 1; Montgomery, 1.

FOREIGN AND INSULAR

CUBA

Habana—Communicable diseases—4 weeks ended April 9, 1938.—During the 4 weeks ended April 9, 1938, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	24	3	Scarlet fever	3	
Lethargic encephalitis	1		Tuberculosis	11	3
Malaria	[1] 15		Typhoid fever	[1] 83	11

[1] Includes imported cases.

CZECHOSLOVAKIA

Communicable diseases—January 1938.—During the month of January 1938, certain communicable diseases were reported in Czechoslovakia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	1		Paratyphoid fever	7	2
Cerebrospinal meningitis	35	11	Poliomyelitis	6	1
Chickenpox	312	1	Puerperal fever	25	9
Diphtheria	3,093	154	Scarlet fever	1,827	18
Dysentery	10	1	Trachoma	56	
Influenza	1,455	3	Tularaemia	2	
Lethargic encephalitis	2	2	Typhoid fever	397	30
Malaria	40				

IRISH FREE STATE

Vital statistics—Fourth quarter ended December 31, 1937.—The following vital statistics for the Irish Free State for the quarter ended December 31, 1937, are taken from the Quarterly Return of Marriages, Births, and Deaths, issued by the Registrar General, and are provisional:

	Number	Rate per 1,000 population		Number	Rate per 1,000 population
Marriages	3,620	4.9	Deaths from—Continued.		
Births	12,808	17.5	Influenza	126	0.17
Total deaths	9,920	13.5	Measles	20	
Deaths under 1 year of age	889	[1] 69	Puerperal sepsis	8	[1] .62
Deaths from—			Scarlet fever	27	
Cancer	910	1.24	Tuberculosis (all forms)	733	1.00
Diarrhea and enteritis (under 2 years)	143		Typhoid fever	21	
Diphtheria	70		Whooping cough	35	

[1] Per 1.000 births.

Vital statistics—Year 1937.—The following vital statistics for the Irish Free State for the year 1937 are taken from the Quarterly Return of Marriages, Births, and Deaths, issued by the Registrar General, and are provisional:

	Number	Rate per 1,000 population		Number	Rate per 1,000 population
Marriages	14,896	5.1	Deaths from—Continued.		
Births	56,564	19.2	Influenza	2,698	0.92
Total deaths	45,115	15.3	Measles	120	
Deaths under 1 year of age	4,057	[1] 72	Puerperal sepsis	44	[1] .78
Deaths from—			Scarlet fever	127	
Cancer	3,558	1.21	Tuberculosis (all forms)	3,582	1.22
Diarrhea and enteritis (under 2 years)	601		Typhoid fever	65	
Diphtheria	289		Typhus fever	4	
			Whooping cough	276	

[1] Per 1,000 births.

VIRGIN ISLANDS

Notifiable diseases—January–March 1938.—During the months of January, February, and March 1938, cases of certain notifiable diseases were reported in the Virgin Islands as follows:

Disease	January	February	March	Disease	January	February	March
Chickenpox	1		20	Pellagra		2	1
Filariasis			1	Pneumonia, broncho		2	1
Gonorrhea	5	6	6	Sprue			1
Hookworm disease	5	1	8	Syphilis	12	22	9
Lymphogranuloma	1			Trachoma			1
Malaria	5	3		Tuberculosis	1	2	1
Mumps	1			Typhoid fever		2	1

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following table must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths; P, present]

Place		Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Week ended—												
						January 1938					February 1938				March 1938			
						1	8	15	22	29	5	12	19	26	5	12	19	26
China:																		
Canton	C	102	14	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Hangchow	C	12	[1] 41	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Hong Kong	C	580	84	7	------	1	------	1	------	------	------	------	------	------	------	------	------	------
	D	344	63	7	------	------	------	1	------	------	------	------	------	------	------	------	------	------
Kwangchow Wan	C	------	62	12	------	------	------	------	------	------	------	------	------	------	------	------	------	------
	D	------	26	10	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Macao	C	190	27	2	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Manchuria:																		
Dairen	C	------	6	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Kwantung Leased Territory	C	3	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Mukden	C	------	2	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Nanking	C	------	120	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
	D	------	14	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Shanghai	C	1,804	1,414	237	22	3	------	------	------	------	------	------	------	------	------	------	------	------
Swatow	C	24	44	101	2	------	------	------	------	------	------	------	------	------	------	------	------	------
Tientsin	C	------	8	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Chosen: Fusan	C	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Dutch East Indies:																		
Celebes	C	[2] 6	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Macassar	C	------	------	------	------	------	------	1	------	------	------	------	------	------	------	------	------	------
India	C	12,203	11,344	6,802	5,323	1,807	1,718	1,490	2,110	2,205	1,772	1,783	------	------	------	------	------	------
	D	5,708	5,787	3,737	2,641	906	766	769	1,065	1,096	920	933	------	------	------	------	------	------
Allahabad	C	------	------	------	------	------	------	------	------	------	------	------	------	------	1	------	1	------
Assam	C	44	59	87	139	35	45	88	53	41	34	44	36	29	61	57	77	103
	D	16	25	53	56	22	22	40	34	23	15	28	23	14	23	32	38	40
Bassein	C	------	------	------	------	------	------	------	------	------	------	------	------	------	------	1	------	------

[1] For 2 weeks.
[2] El Tor strain.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

CHOLERA—Continued

[C indicates cases; D, deaths; P, present]

Place		Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Week ended—												
						January 1938					February 1938				March 1938			
						1	8	15	22	29	5	12	19	26	5	12	19	26
India—Continued.																		
Bombay Presidency	C	3,366	1,375	363	191	7	2		1			4			2	4	8	
	D	1,571	656	171	117	6	1					2			1	2	6	
Bombay	C	[3] 1																
Calcutta	C	56	83	80	69	6	23	24	36	33	45	60	72	49	68	113	184	201
Central Provinces and Berar	C	286	860	356	113	18	4	6	12		3	14	14	25	10	10	61	132
Chittagong	C												1		1			
Delhi	C			1														
Madras Presidency	C	1,844	826	1,204	2,654	890	910	727	569	818		452	236		139	137	56	
	D	771	389	431	1,178	412	338	352	281	421		236	111		64	61	33	
Madras	C	70	106	233	160	38	32	24	10	16	4	3	4	5		2	1	
	D	18	43	34	40	6	7	3	8	5	2	2		2		2		
Negapatam	C	3	1															
	D	1																
Northwest Frontier Province	C	32	19															
Orissa Province	C	111	147	91	39	12	12	12	21	20	3	23	19	37	29	20	31	22
Punjab	C	29																
Rangoon	C			1		1				1								1
Sind State	C	1																
Vizagapatam	C													1				
India (French):																		
Chandernagor Territory	C		4	4	1			1	2	4	6	4						
Karikal Province	C	1					1				2	2						
Pondichery Province	C	1	1		1		1	1		1								
Indochina (French): [4]																		
Annam Province	C		37	364	94	5	20	12	7	19	61	151	72	54	1	2	4	6
Tonkin Province	C	320	4,179	2,342	509	15	26	7	2	9	12	27	2	14	1	8	29	17
Haiphong	C	56	577	44	1													
	D	30	159	27														
Hanoi	C		284	361	39		3										10	7

Japan:[5]																		
Hiroshima	C	32	5															
Kobe	C		1															
Okayama Prefecture	C		5															
Sasebo	C															1		
Taku	C	1	3															
Tokuyama	C		10															
Tokyo	C		1															
Siam:																		
Bangkok	C		2															
Provinces	C	16	7									3						

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[3] Imported.

[4] For reports prior to Aug. 29, 1937, see previous issues of PUBLIC HEALTH REPORTS.

[5] A report states that up to Sept. 30, cholera was reported in Japan, as follows. Hiogo Prefecture, 1 case, 1 death; Hiroshima Prefecture, 40 cases, 14 deaths; Yamaguchi Prefecture 2 cases, 1 death.

On vessels:		
S. S. *Manila Maru* at Moji from Hong Kong	1 case	Aug 31, 1937
S. S. *Anking* at Singapore from Hong Kong	1 case	Sept 10, 1937
S. S. *Sphinx* at Singapore from Hong Kong	1 case	Sept. 15, 1937
On vessels—Continued		
S. S. *Kiungchow* at Hong Kong from Shanghai	3 cases	Oct. 3, 1937
S. S. *Ranee* at Calcutta from Port Said and Blyth	1 case	Dec. 13, 1937

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE[1]

[C indicates cases; D, deaths; P, present]

Place		Aug. 20–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Week ended—												
						January 1938					February 1938				March 1938			
						1	8	15	22	29	5	12	19	26	5	12	19	26
Argentina. (See table below.)																		
Belgian Congo	C		[2] 2		2												4	
Bolivia:																		
Chuquisaca Department	C						2							35				
Sucre	C						[3] 1											
Santa Cruz Department	C												[3] 1					
Tarija Department	C						1	[4] 53					3					
Brazil. (See table below.)																		
British East Africa:																		
Kenya	C	11	15	10							1		1	2				
Uganda	C	50	51	67	38	5	6	5	12	11	2	7	4	11				
	D	48	40	56	30	5	6	4	12	12	2	7	4	11				
Ceylon:																		
Colombo	C		1	1	1	1						1		1		1		
	D		1	1	1		1					1		1				
Plague-infected rats		2	3												2	3		
China:[5]																		
Dutch East Indies:																		
Java and Madura	C	213	223	311	247	67	63											
	D	212	220	311	247	67	63											
Pasoeroean (vicinity of)	C			5	2	2							1					
Ecuador:																		
Chimborazo Province—Chimbo	C														10			
Colimes	C						1											
Guayaquil	C		2		2		1	1	1	1	2			3	2	1	2	
	D		2		1			1	1		2				3		1	
Plague-infected rats		1	2	3	2							3				1		1
Parroquia Eloy Alfaro	C			1														
Egypt:																		
Asyut Province	C			1		1												
Beheira Province	C				1													
Gharbiya Province	C								1									
Girga Province	C		1															

Hawaii Territory:[6] Plague-infected rats:																		
Hawaii Island—Hamakua District:																		
Hamakua Mill Sector		4	8	4	8	1					1		1					
Kukaiau.[6]																		
Paauhau Sector[6]		1	1	5	2		1	2	3	2		2	1		1	2		
Paauilo					18													
Pohakea Sector.[6]																		
Maui Island:																		
Makawao District—Plague-infected rats					6													
Omaopio[6]		1																
Wailuku District—Puunene	D						1											
India	C	1,697	1,996	1,874	446	185	510	238	462	513	545	707						
	D	747	821	742	658	99	237	187	229	213	202	322						
Allahabad	C									1					1			
Bassein	C	2				1				[7] 1	1			1				1
Bombay Presidency	C	62	82	59	51	8			2	14		7			13	11	8	
	D	42	48	36	37	4			2	7		2			6	9	2	
Central Provinces and Berar	C	285	582	592	390	36	91	58	113	188	232	190	156	290	98	413	225	570
Cochin	C	2		1														
Karachi	C	12																
Madras Presidency	C	111	80	175	160	67	65	81	63	54		54	64		7		9	
	D	59	41	84	84	38	35	53	27	21		30	24		5		2	
Mandalay	C									43						79		
	D									41						73		
Punjab	C																1	
Rangoon	C										1	[7] 1		1	2			2
Sind State	C	8																
Indochina (French) (see also table below): Sadec	C	1																
Madagascar. (See table below.)																		
Niger Territory. (See table below.)																		
Peru. (See table below.)																		
Senegal: Dakar	C	1																
Tunisia: Tunis: Plague-infected rats					1								1		1			
Union of South Africa	C	[8] 1	[8] 1							[8] 1		[8] 6		[8] 7				

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[1] Including plague in the United States and its possessions.

[2] Includes 1 case of pneumonic plague.

[3] Pneumonic plague.

[4] Corrected reports.

[5] According to information dated Sept. 2, 115 cases of plague with 105 deaths occurred in Manchuria, China.

[6] Plague has also been reported in Hawaii Territory as follows: Week ended Nov. 20, 1937, 10 rats by mass inoculation in Omaopio, Makawao District, Maui Island; week ended Apr. 2, 1938, 2 rats in Kukaiau, and 1 rat in Paauhau Sector; week ended Apr. 9, 1 rat in Paauhau Sector, and 1 rat in Pohakea Sector.

[7] Imported.

[8] For 2 weeks.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths; P, present]

Place	Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Week ended—												
					January 1938					February 1938				March 1938			
					1	8	15	22	29	5	12	19	26	5	12	19	26
United States:[9]																	
California:[9 10 11]																	
Eldorado County—Plague-infected fleas.																	
Fresno County[10] C	1																
Plague-infected fleas.																	
Plague-infected ground squirrels	3																
Placer County[11]—Plague-infected fleas.																	
San Bernardino County—Plague-infected fleas.																	
Santa Cruz County—Plague-infected fleas.																	
Washington:[9]																	
Adams County—																	
Plague-infected fleas and lice.																	
Plague-infected ground squirrels															1		
Lincoln County—Plague-infected ground squirrels.[12]																	

Place		September 1937	October 1937	November 1937	December 1937	January 1938	February 1938
Argentina:							
Cordoba Province	C	1					
Brazil:[13] Pernambuco State	C			5			
Indochina (French) (see also table above): Cochinchina	C	1					
Madagascar (central region)	C	48	59	67	57	69	70
	D	47	59	65	56	65	56

Place		September 1937	October 1937	November 1937	December 1937	January 1938	February 1938
Niger Territory	C			85	60		
Peru	C	5	9	12	6	7	10
Ancash Department	C			3			
Lambayeque Department	C	2	1			1	2
Libertad Department	C		2	1			1
Lima Department	C	3	6	8	6	6	7

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[9] Plague infection proved in insect hosts as follows: *California*—Eldorado County, Aug. 31; Fresno County, Oct. 7–Nov. 5; San Bernardino County, July 12–Sept. 8; Santa Cruz County, Feb. 3, 1938. *Washington*—Adams County, Mar. 7–30, 1938.

[10] For 5 weeks ended Nov. 6, plague infection proved in pooled tissue from squirrels, chipmunks, and mice in Fresno County, Calif.

[11] For week ended Oct. 9, plague infection proved in pooled tissue from squirrels, chipmunks, and rats, and week ended Oct. 30, pooled tissue from squirrels, in Placer County, Calif.

[12] Week ended Apr. 9, 1938, 2 plague-infected ground squirrels were reported in Lincoln County, Wash.

[13] For the year 1937, 35 cases of plague with 15 deaths were reported in Brazil as follows: Bahia State, 5 cases, 5 deaths; Ceara State, 2 cases; Parahyba State, 5 cases, 1 death; Pernambuco State, 23 cases, 9 deaths.

SMALLPOX

[C indicates cases; D, deaths; P, present]

Place		Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Week ended—												
						January 1938					February 1938				March 1938			
						1	8	15	22	29	5	12	19	26	5	12	19	26
Algeria:																		
Algiers Department	C		1															
Constantine Department	C											1						
Angola. (See table below.)																		
Argentina. (See table below.)																		
Belgian Congo. (See table below.)																		
Bolivia. (See table below.)																		
Brazil. (See also table below):																		
Bahia (alastrim)	C	6	11	6	9													
Recife (alastrim)	C	1																
Santos	C			1														
British East Africa: Tanganyika	C	121		223						1	127	10		53				
Canada:																		
Alberta	C							[1]1		[1]1				[1]3				
British Columbia	C									[1]1		[1]1						
Nova Scotia—Halifax	C																1	
Quebec	C			[1]1														
Saskatchewan	C							[1]1				[1]6		[1]7				
China:																		
Canton [2]	C			1	2			2	6	25	16	23	19	21				
Dairen	C			1									1					
Foochow	C	P	P	P	P													
Hankow	C									2	1	2						
Hong Kong	C		1	6	13	8	30	26	75	116	101	156	222	162	185	214	236	131
	D						15	22		70	88	83	199	132	188	128	192	131
Macao	C											2						
Shanghai	C	1			1			2	3	2	1		6	3	4	1		2
Tientsin	C				1													
Colombia (see also table below): Barranquilla	D		2															
Ecuador: Guayaquil	C	3	13	4	3	2	1		1					1				
Egypt: Port Said	C													3	1	5		
Eritrea	C	28	52	16				7	1		4	3						

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[1] For 2 weeks.

[2] A report dated Feb. 12, 1938, states that for the 3 weeks ended Feb. 12, 1938, 100 cases of smallpox were admitted to hospitals in Canton, China.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Week ended—												
						January 1938					February 1938				March 1938			
						1	8	15	22	29	5	12	19	26	5	12	19	26
France. (See table below.)																		
Great Britain: England and Wales—																		
Chester County	C			1														
Kent County—Gravesend	C																2	1
Leighton Buzzard	C														2			
Port of London	C																	1
Greece. (See table below.)																		
Guatemala. (See table below.)																		
India	C	1,738	1,756	1,804	3,930	1,587	1,662	1,744	2,305	1,950	2,328	2,312						
	D	461	429	408	958	507	506	541	574	517	570	547						
Assam	C	58	45	37	56	21	13	13	19	29	18	19	15	38	38	34	57	18
Bassein	C									1								
Bombay Presidency	C	181	154	130	570	229	208		292	401	523	607	531	731	834	842	753	
	D	38	33	41	165	57	60		91	108	150	161	173	190	177	169	185	
Bombay	C	47	41	73	269	82	92	164	163	189	222	246	233	246	264	234	212	164
	D	23	23	30	119	47	49	86	81	87	125	132	146	142	129	135	127	100
Calcutta	C	28	20	24	69	43	46	46	52	48	56	106	120	149	194	185	261	208
	D	17	14	13	43	31	35	34	31	46	27	77	76	93	132	106	166	161
Cawnpore	C						9		2	3	5	4	4	5	2	1	4	6
Central Provinces and Berar	C	44	26	7	15	2	9	11	22	7	39	46	55	90	53	83	38	75
Chittagong	C						1		2				1			2		[3] 2
Delhi	C		1		6	2	[3] 4		1	2	6	1	5	1	3		3	5
Karachi	C	[3] 2		2	4	3	[3] 3	6	3	3		4	6	2	2	4	6	5
Madras Presidency	C	318	304	213	245	111	137	149	256	246		245	221		87	93	77	
	D	63	51	26	51	25	21	31	44	51		50	41		15	24	22	
Madras	C	76	74	50	88	58	50	64	107	80	76	71	58	43	52	64	69	64
Negapatam	C											6				2	4	2
Northwest Frontier Province	C	27	154	380	417	277	196	88	202	75	32	39	46	43	29	31	34	61
Orissa Province	C	117	153	206	353	102	147	93	267	202	198	188	248	306	224	303	318	446
Punjab	C	69	162	404	1,035	310	332	380	337	282	250	181	281	240	249	149	201	237
Rangoon	C		3	5	6	7	9	17	19	14	12	16	5	9	21	23	24	9
Sind State	C	63	78	164	436	97	67	119	201	159	127	64	124	167	79	180	159	104
Vizagapatam	C														1		1	
Indochina (French) (see also table below):																		
Tonkin Province	C				26		75	60			135	130	160	282	116	195	227	137
Haiphong	C			2	56	14	41	32	31	51	45	52	27	24	12	9	19	5

Hanoi	C				1	1		2	1	1	3	8		4	2	3	8	3
Saigon-Cholon	C									1			1					1
Iran	C			2					4		6							
Iraq	C					5		6	1	1				8				
Baghdad	C											1						
Mexico (see also table below):																		
Chihuahua	C	1														1		
Durango	D		1								1			1	2			
Mexico, D. F	C	6	5	11	2			2				3				1		
Monterrey	C	2		1	1		1	1	2	1			1					
San Luis Potosi	D		1															
Torreon	C	1			2		1		5	1								
	D	3	5	4	7		2		1	1	1		1					
Vera Cruz	C				1													
Morocco. (See table below.)																		
Nigeria	C	11	156	29	136		104					57						
Nyasaland	C		31	11	3	3												
Panama Canal Zone: Colon	C		2															
Portugal (see also table below):																		
Lisbon	C	5	3	3	2			4			1		1	2	5	5	1	1
Oporto	C	2																
Portuguese East Africa. (See table below.)																		
Salvador. (See table below.)																		
Siam	C					35	12	12	16	1				26	67		8	9
Sierra Leone	C		10											4				
Southern Rhodesia	C		4	121	114		10		3		2	16	3					
Straits Settlements: Singapore	C									1								
Sudan (Anglo-Egyptian)	C	27	64	88	64	44	28	2	81	127	22	25	9	7	34	2	18	4
Union of South Africa. (See table below.)																		
Venezuela: Puerto Cabello.[4]																		

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[3] Imported.

[4] A report dated Feb. 10, 1938, states that 16 cases of smallpox were reported in Puerto Cabello; information dated Feb. 21, states that 4,000 cases of smallpox (alastrim) were reported in Barquisimeto, Lara State, Venezuela, and that smallpox is present from Barquisimeto to Valencia and Marcay.

On vessels:

S. S. *Empress of Asia* at Honolulu	1 case	Sept. 5, 1937
S. S. *Castalia* at Suez from Karachi and Bombay	1 case	Oct. 5, 1937
S. S. *Egra* at Rangoon from Calcutta	1 case	Nov. 16, 1937
S. S. *Anhui* at Singapore from Hong Kong	1 case	Jan. 19, 1938
S. S. *Rizwani* at Kamaran	1 case	Jan. 19, 1938
S. S. *Tai Seun Heng* at Sandakan from Hong Kong	1 case	Jan. 23, 1938
S. S. *Suisang* at Penang from Hong Kong and Singapore	1 case	Jan. 26, 1938
S. S. *Hong Siang* at Singapore from Amoy, Swatow, and Hong Kong	1 case	Jan. 26, 1938
S. S. *Trave* at Singapore from Hong Kong	1 case	Jan. 27, 1938
S. S. *Muinam* at Singapore from Hong Kong	1 case	Jan. 29, 1938
S. S. *Tatsuta Maru* at Honolulu	1 case	Feb. 4, 1938
S. S. *Circassia* at Aden from Bombay	1 case	Feb. 16, 1938
S. S. *Chantala* at Akyab from Chittagong	1 case	Feb. 18, 1938
S. S. *Empress of Japan* at Honolulu	1 case	Feb. 21, 1938
S. S. *Tilawa* at Singapore from Hong Kong	1 case	Feb. 21, 1938

On vessels—Continued.

S. S. *Seringa* at Calcutta from Port Said	1 case	Feb. 21, 1938
S. S. *Yuen Sang* at Singapore from Hong Kong	1 case	Feb. 28, 1938
S. S. *Cathay* at London	1 case	Mar. 4, 1938
S. S. *City of Auckland* at Halifax from Calcutta	1 case	Mar. 5, 1938
S. S. *Kaisar-I-Hind* at Yokohama from Hong Kong	3 cases	Mar. 6-7, 1938
S. S. *Van Heutsz* at Singapore from Amoy, Swatow, and Hong Kong	1 case	Mar. 9, 1938
S. S. *Hai Hing* at Singapore from Amoy, Swatow, and Hoihow	1 case	Mar. 9, 1938
S. S. *Nituka Maru* at Moji from Dairen	1 case	Mar. 11, 1938
S. S. *Norriken* at Singapore from Hong Kong and Swatow	1 case	Mar. 13, 1938
S. S. *Kum Sang* at Singapore from Kobe, Amoy, and Hong Kong	1 case	Mar. 16, 1938
S. S. *Haruna Maru* at Kobe from Hong Kong	1 case	Mar. 16, 1938
S. S. *Hinsang* at Sandakan from Hong Kong	1 case	Mar. 24, 1938

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		September 1937	October 1937	November 1937	December 1937	January 1938	February 1938
Angola	C	18			7	19	
Argentina	C		3	1			
Belgian Congo	C	391	352	166	292	251	
Bolivia:							
Cochabamba Department	C						[5] 4
La Paz Department	C						[5] 11
La Paz	C	30					
Potosi Department	C						[5] 5
Santa Cruz Department	C						[5] 5
Brazil: Puerto Alegre	C	13	4	2			
France	C			2			
Greece: Salonika	C			3	7	10	1
Indochina (French) (see also table above)	C	96	147	197	319	694	864
	D	12	28	43	91	188	189
Mexico (see also table above):							
Aguascalientes State	C	5					
Campeche State	C	1					
Chihuahua State	C	4		21			
Coahuila State	C	2		17			
Durango State	C	15		17			
Guanajuato State	C	7		38			
Hidalgo State	C	1					
Mexico—Continued.							
Jalisco State	C	5					
Mexico State	C	3		3			
Mexico, D. F.	C	11	5	17		8	
Mexico City	D	2					
Michoacan State	C	37		59			
Nayarit State	C	1					
Nuevo Leon State	C	2		6			
Queretaro State	C	5	1	2			
Sinaloa State	C	3					
Tabasco State	C	1		1			
Tlaxcala State	C	3		3			
Vera Cruz State	C	2	1	25			
Yucatan State	C			1			
Zacatecas State	C	1		7			
Morocco	C	1	1	2			
Portugal (see also table above)	C	61	53	52	18	62	
	D	8	4	4	3	2	
Portuguese East Africa	C			8			
Salvador	C					16	2
Union of South Africa:							
Cape Province	C				42		
Transvaal	C				41		

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[5] For January and February.

TYPHUS FEVER

[C indicates cases; D, deaths; P, present]

Place		Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Week ended—															
					December 1937				January 1938					February 1938				March 1938		
					4	11	18	25	1	8	15	22	29	5	12	19	26	5	12	19
Algeria:																				
Algiers Department	C	7	38	89		6		7				13	11	8	5	5	11	15	36	13
Algiers	C		15											2		1	6	1	2	
Constantine Department	C	26	47	23	29	37		15	21		¹26	50	20	13	46	15	24	12	59	26
Bone	C		1			1							2		1		1			
Constantine	C	2	7									1		4	20		14	4		
Philippeville	C		2	1										1	1					
Oran Department	C	4		16	2			20	1		¹3		1	6	2	3	2	2		1
Southern Territories	C			2		1							1	13	1	1	2		13	
Australia: Brisbane	C										1									
Basutoland	C	6	3																	
Bolivia. (See table below.)																				
British East Africa: Kenya	C										1									
Bulgaria	C		13				5			14	1	3	6		2					
Chile	C	176	305	286	57	32	64	43												
Antofagasta Province	C	1		4																
Concepcion Province	C	7	4	2	1															
Iquique	C			1			1													
Linares Province	C	5	2	12	2	1														
Malleco Province	C	6	4	3		3														
Nuble Province	C	14	24	19	5	7	5	2												
Santiago Province	C	114	230	223	44	20	57	36												
Valparaiso	C	14	16	5	1					1	2	1	2		1		1	2		1
China (see also table below):																				
Canton	C		3																	
Dairen	C		1	2			1													
Hankow	C		2										1	1						
Harbin	C											1								
Shanghai	C	2								1										
Swatow	C																			
Tientsin	C	3	1	7	4				1											
Chosen. (See table below.)																				

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¹ For 2 weeks.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER—Continued

[C indicates cases; D, deaths; P, present]

Place		Aug. 20–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Week ended—															
					December 1937				January 1938					February 1938				March 1938		
					4	11	18	25	1	8	15	22	29	5	12	19	26	5	12	19
Egypt:																				
Alexandria	C	4	4	7	2			1	1							1	1	1	4	
Aswan Province	C																3			16
Asyut Province	C		1								1									
Beheira Province	C										6	3				1	9		12	21
Beni-Suef Province	C			1																
Cairo	C	1				1			3						1	1			7	3
Dakahliya Province	C										1					30	19		17	10
Gharbiya Province	C										3					12	2		4	1
Minufiya Province	C											3					13		2	2
Minya Province	C																5		8	3
Qena Province	C										1								5	20
Sharkiya Province	C															7			7	5
Suez	C	2																		
Provinces	C	10	3	7	1		4	2	6	11	12	6	26	24	40	54	59	35	61	84
Eritrea: Asmara	C			2																
Germany: Frankfort-on-Main	C		1																	
Great Britain—England and Wales—																				
Gloucester County	C			1																
Greece. (See table below.)																				
Guatemala. (See table below.)																				
Hawaii Territory: Honolulu	C	2	4	1			1		1	1					1				1	
Iran	C	1					4									1				
Latvia. (See table below.)																				
Lithuania. (See table below.)																				
Mexico (see also table below:																				
Chihuahua	C			2																
Mexico, D. F.	C	22	17	18	13	3	3	1		12	1				4	3	5	3	5	
Saltillo	D														1					
San Luis Potosi	D													1						
Tecamachalco	C								7											
Torreon	C			1									1							
Morocco (see also table below)	C	16	38	29	18	58	102	137	198	80	139	142	184	131	204	208	240	269	411	372
Casablanca	C		4				4	20		16	6		57	44	45	67	17	29	70	78
Netherlands: Rotterdam	C						[2]1													

Palestine:																				
Haifa	C	11	16	5	3	3	2		2			1	1							
Jaffa	C	9	13	17			2	1			3	2		1	1	1		1	1	1
Panama Canal Zone. (See table below.)																				
Poland	C	26	53	68	37	40	35	29	54	98	78	87	79	112	76	93	150	145	161	
	D		1	5		1	1	1	1	6	7	9	7	6	6	6	5	7	11	
Portugal. (See table below.)																				
Rumania. (See table below.)																				
Sierra Leone: Freetown	C				1															
Straits Settlements: Singapore	C	1	1								1		1			1				
Switzerland	C		1																	
Syria: Deir-ez-Zor	C																10			
Trans-Jordan	C			1										2						
Tunisia:																				
Tunis	C	7	3	3	1			1	2					2		1	1	3	1	
Provinces	C	76	132	161	11	34		12	12	26	80	62	104	37	32	83	59	100	41	75
Turkey. (See table below.)																				
Union of South Africa. (See table below.)																				
Yugoslavia: Belgrade	C			1											1					
On vessel: S. S. *Blackhill* at Philippeville	C											1								

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER—Continued

Place		September 1937	October 1937	November 1937	December 1937	January 1938	February 1938
Bolivia:							
La Paz Department	C	-------	-------	-------	-------	-------	[3] 18
Oruro Department	C	-------	-------	-------	-------	-------	[3] 9
Potosi Department	C	-------	-------	-------	-------	-------	[3] 5
China: Manchuria—Harbin	C	2	-------	-------	-------	3	1
Chosen	C	-------	19	-------	-------	-------	-------
Greece	C	6	18	7	7	-------	-------
Guatemala	C	6	2	-------	-------	3	-------
Latvia	C	1	-------	-------	-------	-------	-------
Lithuania	C	2	6	7	2	12	-------
Mexico (see also table above):							
Aguascalientes State	C	1	-------	1	-------	13	-------
Campeche State	C	2	-------	-------	-------	-------	-------
Coahuila State	C	-------	-------	3	-------	-------	-------
Durango State	C	1	-------	8	-------	-------	-------
Guanajuato State	C	19	-------	22	-------	-------	-------
Guerrero State	C	-------	-------	2	-------	-------	-------
Hidalgo State	C	4	2	19	-------	-------	-------
Jalisco State	C	2	-------	2	-------	-------	-------
Mexico State	C	29	19	42	-------	8	-------
Mexico D. F.	C	29	14	20	-------	27	-------
Mexico City	D	4	-------	-------	-------	5	4
Mexico—Continued.							
Michoacan State	C	5	-------	11	-------	-------	-------
Oaxaca State	C	-------	-------	3	-------	1	-------
Puebla State	C	55	-------	9	-------	-------	-------
Queretaro State	C	3	2	2	-------	-------	-------
San Luis Potosi State	C	6	4	-------	-------	5	-------
Tamaulipas State	C	2	-------	-------	-------	-------	-------
Tlaxcala State	C	3	-------	-------	-------	-------	-------
Vera Cruz State	C	9	-------	-------	-------	-------	-------
Zacatecas State	C	2	-------	6	-------	-------	-------
Morocco (see also table above)	C	16	39	47	914	638	1,115
Panama Canal Zone	C	1	-------	-------	-------	-------	-------
Portugal	C	1	26	28	7	2	-------
Rumania	C	31	33	110	246	470	-------
Turkey	C	27	100	34	45	96	-------
Istanbul	C	4	-------	4	2	3	10
Union of South Africa:							
Cape Province	C	-------	162	75	100	37	-------
Natal	C	-------	-------	9	1	-------	-------
Orange Free State	C	-------	3	3	3	30	-------
Transvaal	C	-------	5	1	1	12	-------

---

[3] For January and February.

YELLOW FEVER

[C indicates cases; D, deaths; P, present]

Place		Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Week ended—															
					December 1937				January 1938					February 1938				March 1938		
					4	11	18	25	1	8	15	22	29	5	12	19	26	5	12	19
Belgian Congo:																				
Saratumba	C																	[1] 1		
Zongo	C														[1] 7			[1] 4		
	D														4			1		
Brazil: [2]																				
Federal District	D															1		1		
Minas Geraes State [3]	D									1	2	7	6	16	9	24	17	26	10	9
Para State	D	1										1								
Rio de Janeiro State [3]	D											1	5	3	3	2	1	3	10	7
Santa Catharina State	D				1									1				1		2
Sao Paulo State	C														P					
	D								1							1				
Colombia:																				
Boyaca Department	D		1				1													
Caldas Department	D	1																		
Cundinamarca Department	D	2									1					1				
Intendencia of Meta—Villavicencio	D	1																		
Santander Department	C	2																		
	D	6	3			1		2												
Dahomey: Cotonou	C						[1] 5													
French Equatorial Africa:																				
Bangui	D	1									1									
Fort Archambault	C	[1] 2																		
Gambia: Georgetown	C										[1] 1									
Gold Coast	C	3	4	[4] 8			2		5	[5] 4										
	D	2	1	3			2													
Accra	C	[1] 1																		
Keta	C								1											

---

[1] Suspected.

[2] See also reports of yellow fever in Brazil on pp. 216, 280, 361, 404, 437, 517, and 585 of the PUBLIC HEALTH REPORTS for 1938, and in various issues for 1937.

[3] Week ended Mar. 26, 1938, 1 death from yellow fever was reported in Minas Geraes State, and 1 death in Rio de Janeiro State, Brazil.

[4] Includes 2 suspected cases.

[5] Includes 1 suspected case.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER—Continued

[C indicates cases; D, deaths; P, present]

Place		Aug. 29–Sept. 25, 1937	Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Week ended—															
					December 1937				January 1938					February 1938				March 1938		
					4	11	18	25	1	8	15	22	29	5	12	19	26	5	12	19
Ivory Coast:																				
Abidjan	C	-	-	-	-	-	-	-	-	-	-	-	-	1	-	[1]1	-	-	-	-
Agboville	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	[1]1	-
Anyama	C	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-
Gaoua	C	[5]3	-	-	[1]1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	D	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Grand Bassam	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
Spao Plantations (near Bingerville)	C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-
Touba	C	[1]1	[1]1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nigeria	C	2	5	2	-			[1]1	1	-	1	-	[1]1	-	-	-	-	-	-	-
	D	-	-	1	-	-	-	-	-	-	1	-	[1]1	-	-	-	-	-	-	-
Paraguay: Asuncion	C	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Senegal	C	2	12	[6]12	1	-	1	1	-	-	-	-	-	-	-	[1]1	-	-	-	-
	D	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dakar	C	-	[7]1	[7]2	-	-	-	-	-	-	-	-	-	-	-	[1]1	-	-	-	-
Rufisque	C	-	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thies	C	-	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sudan (French)	C	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
San	C	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-
Toukoto	C	-	-	[1]1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[1] Suspected.
[5] Includes 1 suspected case.
[6] Includes 3 suspected cases.
[7] Imported.

UNITED STATES TREASURY DEPARTMENT

PUBLIC HEALTH REPORTS

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MAY 6 - - - - - - - - 1938

IN THIS ISSUE

Mortality and Morbidity Trends During 1937 and Prior Years
A Discussion of the Developments in Shellfish Sanitation
The Organization and Conduct of Stream Pollution Surveys

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UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg. Gen. ROBERT OLESEN, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

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PUBLIC HEALTH REPORTS

VOL. 53 MAY 6, 1938 NO. 18

TREND OF MORTALITY AND MORBIDITY DURING 1937 AND RECENT PRECEDING YEARS

Based on Provisional Data For All Years

MORTALITY

The mortality rates in this report are based on preliminary data for 40 States, the District of Columbia, and Hawaii for the calendar year 1937. This area includes about 85 percent of the total population of the country. Data are presented for each State except New Hampshire, Florida, Mississippi, Arkansas, Texas, New Mexico, Arizona, and California.

This report is made possible through a cooperative arrangement with the respective States which voluntarily furnish provisional tabulations of current birth and death records to the United States Public Health Service which acts as a clearing house and provides for publication of the data received. Because of (*a*) lack of uniformity in the method of classifying deaths according to cause, (*b*) insufficient time to obtain additional information from the doctor to help in the classification of all doubtful cases, and (*c*) the impossibility of including a certain number of certificates that were not filed when the records were tabulated, these data are preliminary and may differ in some instances from the final figures subsequently published by the Bureau of the Census. The number of States included is considerably larger than the number used heretofore; several States began reporting for the first time during 1936 and 1937.

Preliminary data for previous years from the same source, collected and tabulated in the same way as have been the current data, are included for comparative purposes. These figures are used in preference to the final figures published by the Bureau of the Census because it is believed that they are more nearly comparable with the current provisional information and therefore will show the trend more accurately. Comparative data for all of the preceding years for a few States were not available, and so it was necessary to substitute figures obtained from published State reports in certain instances.

In the past these preliminary reports have provided an early and accurate index of the trend in mortality for the country as a whole.

Some deviation from the final figures for individual States is to be expected because of the provisional nature of the information. It is believed, however, that the trend of mortality within each State is correctly represented. Comparisons of specific causes of death among different States are subject to error because of differences in tabulation procedure and completeness of reporting. Comparisons of this nature should be made only from the final figures published by the Bureau of the Census.

In spite of a minor influenza epidemic during the first quarter of 1937, which resulted in a total mortality rate for that period 7.5 percent above the corresponding rate in 1934 and 1935 and about 2 percent above that for 1936, the mortality rate from all causes for the year, 10.9 per 1,000 estimated population, was 3.5 percent less than in 1936 and approximately equal to the average rate for the period 1933–36 (table 1). Thirty-two of the 41 States (including the District of Columbia) reported a lower death rate than in 1936. During the last three quarters of the year, the total death rate was the lowest reported during the 4 years for which comparative data are shown in table 2.

DISEASES WITH NEW LOW DEATH RATES

For the following diseases, or groups of diseases, the death rates reported in 1937 were the lowest recorded during the past 5 years: Typhoid and paratyphoid fever, scarlet fever, diphtheria, tuberculosis, malaria, pellagra, diseases of the digestive system, nephritis, and diseases associated with pregnancy and childbirth.

The decline in maternal mortality continued throughout 1937, making the seventh consecutive year in which the mortality from the diseases incidental to pregnancy and childbirth has continuously declined. The 1937 rate was 13 percent less than that for 1936 and 22 percent less than the 1933 rate.

It is gratifying to note that the decline in mortality from tuberculosis, which was checked in 1936, has again been resumed. The mortality rate declined 9.6 percent from that recorded in 1936 and reached a new low figure of 49.6 per 100,000 population.

Two of the important communicable diseases of childhood, scarlet fever and diphtheria, were at the lowest level in recent years. The death rate from diphtheria was only about one-half that in 1933, while the rate from scarlet fever was about one-third the corresponding figure for that year.

DISEASES WITH LITTLE OR NO CHANGE

The death rate from meningitis, diabetes, cerebral hemorrhage, heart disease, pneumonia, and accidents was about the same as in previous years. Mortality from pneumonia decreased about 8 percent as compared with 1936, but it was well above the average of the preceding 4 years.

Mortality from heart disease, although slightly less than in 1936, was still about 10 percent higher than during the 3-year period 1933–35. This disease has been increasing in frequency as a cause of death for many years.

The relative importance of accidents as a cause of death has been steadily increasing. In 1937 this cause ranked sixth in importance among all causes and was only slightly less frequent than nephritis as a cause of death. The total death rate from all accidents was 77.4 per 100,000 population, representing a decline of nearly 9 percent from the rate for 1936. The death rate from automobile accidents remained unchanged at 27.7 per 100,000 population.

DISEASES WITH INCREASED DEATH RATES

Mortality from encephalitis, measles, whooping cough, influenza, poliomyelitis, and cancer was higher than in 1936. The incidence of measles and whooping cough fluctuates from year to year, and so the slight increase in 1937 was not unusual. As pointed out in the Public Health Reports for December 17, 1937, Hawaii experienced during 1937 one of the most severe epidemics of measles in recent history. The death rate was 41.7 per 100,000 population as compared with a rate of 0.8 for this group of States and a rate of 2.9 for Kentucky, which reported the highest rate in the United States.

Both influenza and poliomyelitis were epidemic during 1937. For each of these diseases the death rate was the highest recorded during the past 5 years. Both epidemics were fairly widespread, 31 States reporting an increased death rate from influenza and 28 States reporting an increased death rate from poliomyelitis. The highest rates for poliomyelitis were reported from the States west of the Mississippi River; Colorado, Nebraska, and Wyoming each reported a rate greater than 3 per 100,000 population, while Oklahoma reported a rate of 2.3 per 100,000 population.

The death rate from cancer has been steadily increasing, which is due in part to the aging of the population. The rate for 1937, however, was less than 1 percent greater than that for 1936.

BIRTH RATE AND INFANT MORTALITY

The birth rate, which has been declining for many years, increased about 2 percent as compared with 1936 and equaled the rate for 1935. Twenty-seven States reported a higher rate, 12 States reported a lower rate, and 1 State reported the same rate as in 1936.

The infant-mortality rate decreased about 5 percent as compared with 1936 and was the lowest rate reported for these States. This rate, 52 per 1,000 live births, will undoubtedly be slightly less than the final rate for the entire country since 6 of the States for which no reports were received, and which are, therefore, not included, have relatively high infant-mortality rates.

MORBIDITY

The following data concerning the prevalence of eight communicable diseases are based on reports submitted by the health officers of the several States and the District of Columbia. Although cases of each of these diseases are reportable by law, there is considerable variability in the completeness of the reports. The number of cases reported is somewhat smaller than the number of cases which occur during any given year, but it is believed that the reports are sufficiently complete to reveal unusual prevalence arising from an epidemic.

TABLE A.—*Number of reported cases of certain communicable diseases in the United States in 1936 and 1937 and the median number of cases reported, 1932–36*

Disease	Cases		Median number of cases, 1932–36	Number of States reporting
	1937[1]	1936		
Diphtheria	28,458	30,018	43,156	48
Influenza	402,887	281,757	262,551	35
Measles	311,515	297,398	403,105	46
Meningococcus meningitis	4,989	6,720	3,099	40
Poliomyelitis	8,326	4,286	4,983	45
Scarlet fever	228,877	244,332	220,050	48
Smallpox	11,497	7,834	7,834	48
Typhoid fever and paratyphoid fever	15,841	15,808	22,217	48

[1] Figures for 1937 are preliminary.

DISEASES ABOVE THE MEDIAN PREVALENCE

Two diseases, influenza and poliomyelitis, were sufficiently prevalent to be considered epidemic during 1937. The influenza epidemic started in the West South Central States in December 1936, and by January 1 had spread to all parts of the country. The epidemic was relatively mild and reached its peak during the last week in January. The number of reported cases was about 40 percent greater than in 1936 and 50 percent above the median for the preceding 5 years (fig. 1).

An increased incidence of poliomyelitis was noticed in the South Central States during the latter part of June. By the end of July the epidemic was reported from all parts of the country except the Northeast, where the incidence remained relatively low. The outbreak was most severe in the South Central and East North Central States. The peak of the epidemic was reached shortly after the middle of September. Although the number of reported cases was less than in 1935, it was 67 percent above the average of the preceding 5 years (fig. 2).

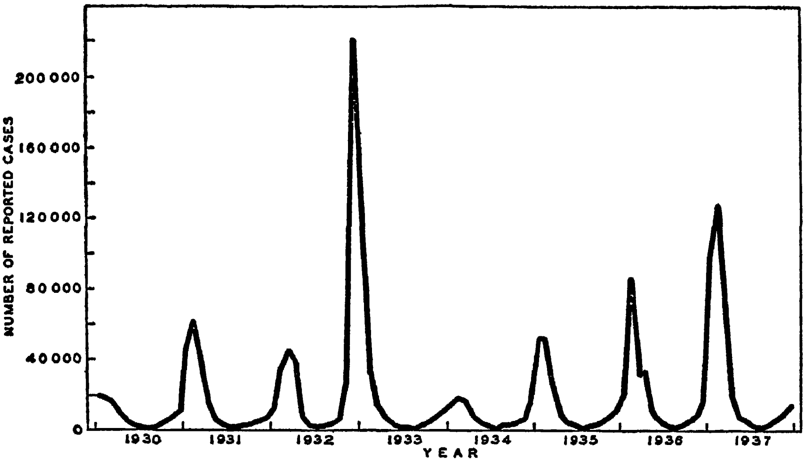

FIGURE 1.—Number of reported cases of influenza, by months, 1930-1937.

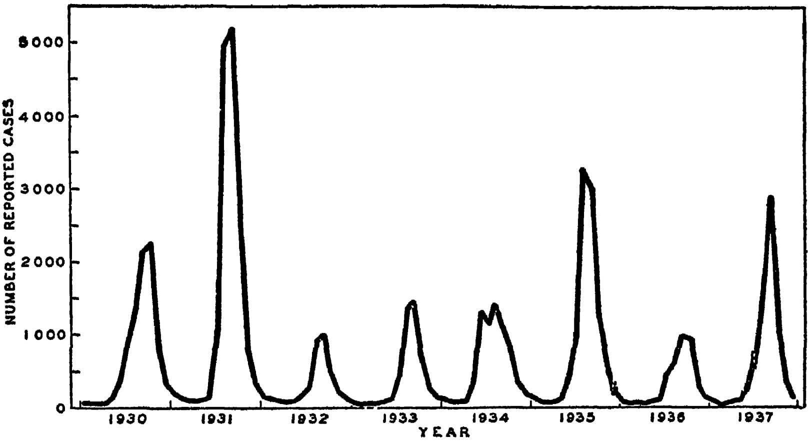

FIGURE 2.—Number of reported cases of poliomyelitis, by months, 1930-1937.

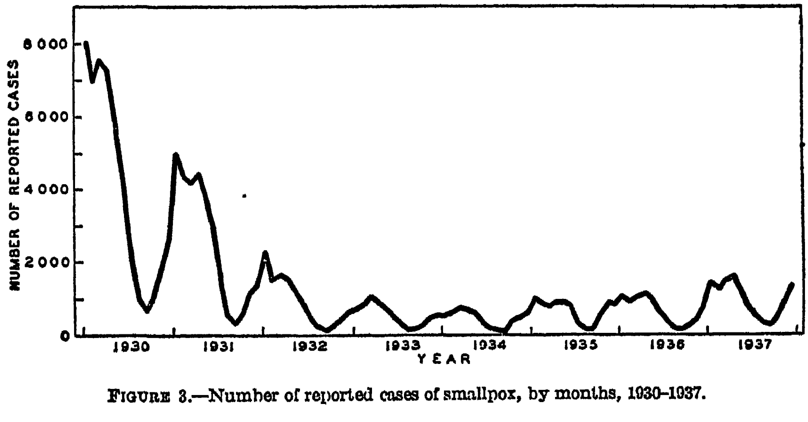

FIGURE 3.—Number of reported cases of smallpox, by months, 1930-1937.

Although the prevalence of smallpox was not of epidemic proportions, the number of cases reported in 1937 was the largest since 1931. About three-fourths of the cases were reported from the Northwest and Pacific Coast States.

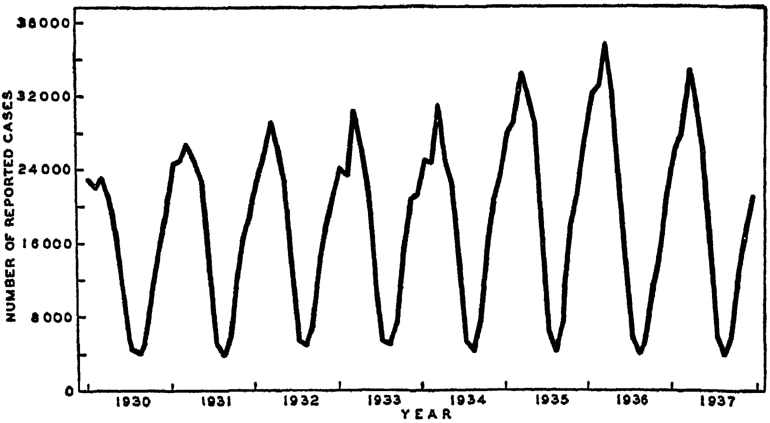

FIGURE 4.—Number of reported cases of scarlet fever, by months, 1930–1937.

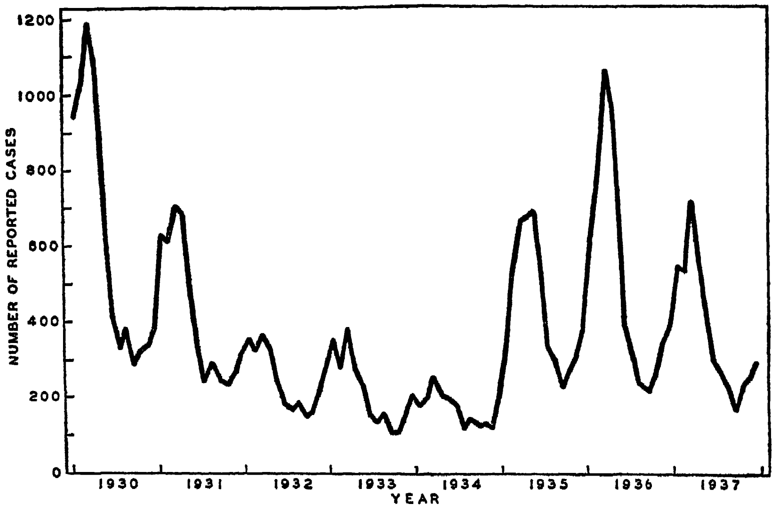

FIGURE 5.—Number of reported cases of meningococcus meningitis, by months, 1930–1937.

Both scarlet fever and meningococcus meningitis were less prevalent than in 1936, but the number of reported cases was somewhat above the average of the preceding 5 years. There were mild outbreaks of scarlet fever in the New England and West South Central States, but the number of cases reported from the remainder of the country was about normal.

DISEASES BELOW THE MEDIAN PREVALENCE

The number of reported cases of diphtheria, measles, and typhoid and paratyphoid fever was 34, 23, and 29 percent, respectively, below the median number of cases reported for the 5-year period 1932–36. The West South Central and Mountain States reported more cases of diphtheria than in 1936, but for the whole country the number of reported cases has been continuously declining for several years.

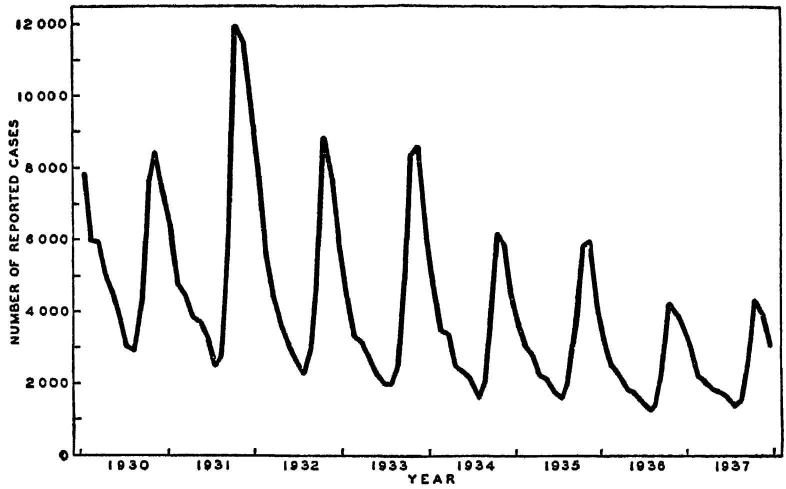

FIGURE 6.—Number of reported cases of diphtheria, by months, 1930–1937.

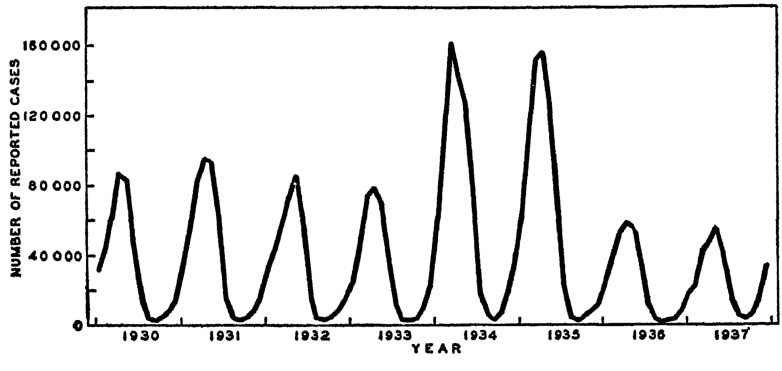

FIGURE 7.—Number of reported cases of measles, by months, 1930–1937.

Although the number of cases of measles was slightly greater than in 1936, it was less than one-half the number reported in either 1934 or 1935, which were years of unusually high incidence. About the first of November, however, a definite increase in the number of cases of measles became evident, and by December it was apparent that another year of exceptionally high measles incidence was beginning. Preliminary data for 1938 indicate that during the winter of 1937–38 the number of measles cases has exceeded any preceding like period in recent years.

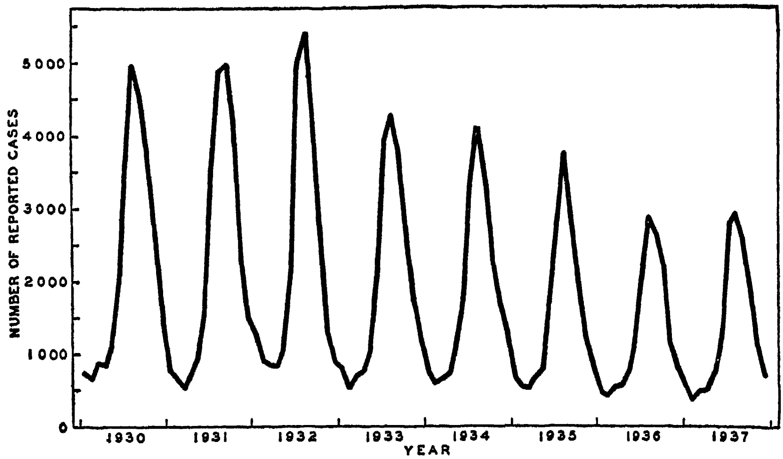

FIGURE 8.—Number of reported cases of typhoid fever, by months, 1930–1937.

TABLE 1.—*Summary of mortality trends from certain causes in a group of 41 States, 1933–37* [1] *(Estimated population July 1, 1937, 109,846,000* [2]*)*

RATES PROVISIONAL FOR ALL YEARS

Diseases (numbers in parentheses are from the International List of Causes of Death, fourth revision, 1929)	1937	1936	1935	1934	1933
	Rate per 1,000 population				
Deaths, all causes	10.9	11.3	10.8	11.0	10.6
Births, exclusive of stillbirths	16.6	16.3	16.6	16.7	16.2
	Rate per 1,000 live births				
Infant mortality (live births, 1937, 1,829,420)	52	55	54	59	57
Maternal mortality	4.6	5.3	5.6	5.7	5.8
	Death rate per 100,000 population				
Typhoid and paratyphoid fever (1, 2)	1.7	2.1	2.3	2.9	3.0
Measles (7)	.8	.7	3.1	4.7	1.6
Scarlet fever (8)	1.5	2.0	2.8	2.1	2.2
Whooping cough (9)	3.5	2.0	3.8	5.4	3.0
Diphtheria (10)	1.8	2.0	2.7	3.0	3.4
Influenza (11)	27.5	23.3	21.0	16.4	25.2
Poliomyelitis and polioencephalitis (16)	.9	.5	.8	.6	.7
Encephalitis, epidemic or lethargic (17)	.7	.6	.7	.7	1.1
Epidemic cerebrospinal meningitis (18)	1.6	2.2	2.2	.9	1.0
Tuberculosis, all forms (23–32)	49.6	51.7	51.6	52.9	55.5
Malaria (38)	1.3	2.1	2.2	2.1	2.0
Cancer, all forms (45–53)	112.1	111.8	109.3	107.6	103.7
Diabetes (59)	24.2	24.4	22.8	22.8	21.6
Pellagra (62)	1.9	2.1	2.0	2.2	2.3
Cerebral hemorrhage, apoplexy (82a, b)	85.4	89.7	85.3	82.2	81.7
Diseases of the heart (90–95)	263.4	265.4	244.2	239.8	222.9
Pneumonia, all forms (107–109)	84.3	92.0	83.0	81.1	71.8
Diseases of the digestive system (115–129) [3]	63.4	68.4	66.6	71.8	65.5
Diarrhea and enteritis under 2 years (119)	8.8	10.3	8.7	11.8	10.5
Nephritis, all forms (130–132)	78.8	82.6	81.1	84.5	81.9
Accidents (176–195, 201–214)	77.4	84.9	77.0	79.4	71.9
Automobile accidents (206, 208, 210)	27.7	27.7	27.2	27.8	24.2

[1] The States included are those listed in table 3, with the exception of California and Florida.

[2] All populations given or used in computing rates are official estimates of the Bureau of the Census as of July 1 of each year.

[3] 39 States only.

TABLE 2.—*Trends of mortality from certain causes in each quarter of 1937, 1936, 1935, and 1934 in the 23*[1] *States with available data (estimated population July 1, 1937, 74,151,000)*

RATES PROVISIONAL FOR ALL YEARS

State and period	All causes, rate per 1,000 population (annual basis)	Births (exclusive of stillbirths) per 1,000 population (annual basis)	Rate per 1,000 live births		Death rate per 100,000 population (annual basis)																			
			Total infant mortality	Maternal mortality	Typhoid fever (1, 2)	Measles (7)	Scarlet fever (8)	Whooping cough (9)	Diphtheria (10)	Influenza (11)	Acute poliomyelitis and polioencephalitis (16)	Encephalitis, epidemic or lethargic (17)	Epidemic cerebrospinal meningitis (18)	Tuberculosis, all forms (23–32)	Cancer, all forms (45–53)	Diabetes (59)	Cerebral hemorrhage, apoplexy (82a, b)	Diseases of the heart (90–95)	Pneumonia, all forms (107–109)	Diseases of the digestive system (115–129)	Diarrhea and enteritis under 2 years (119)	Nephritis (130–132)	All accidents (170–194,[2] 201–214)[1]	Automobile accidents[2] (206, 208, 210)[1]
January–December:																								
1937	11.0	16.2	59	4.3	1.4	0.7	1.5	3.1	1.5	25.2	0.9	0.6	1.5	49.2	117.8	26.2	83.1	274.9	81.4	63.4	7.4	73.3	77.0	27.3
1936	11.3	16.0	53	5.0	1.6	.6	2.1	1.9	1.8	20.2	.4	.6	2.3	50.8	116.4	26.1	88.0	276.7	89.1	67.1	8.8	81.8	------	------
1935	10.8	16.1	52	5.2	1.8	3.0	2.3	3.3	2.3	18.8	.7	.6	2.1	50.9	113.8	24.3	84.1	252.7	81.7	65.7	7.2	80.4	------	------
1934	11.0	16.1	57	5.4	2.4	3.8	2.1	4.5	2.4	14.9	.5	.7	.9	52.3	111.6	21.3	79.1	248.5	79.8	70.2	10.3	84.5	------	------
January–March:																								
1937	12.8	15.3	61	5.3	.6	.7	2.9	3.1	1.8	69.3	.2	.7	2.4	53.6	116.9	31.0	92.8	314.6	144.1	60.1	4.2	87.5	63.2	23.0
1936	12.5	15.6	58	5.8	.9	.9	3.6	2.0	2.2	36.4	.2	.6	3.5	53.0	114.7	30.4	98.0	311.5	142.4	62.1	4.8	92.4	------	------
1935	11.9	15.5	63	6.0	.8	5.0	3.2	3.8	2.4	44.1	.2	.6	2.4	54.0	110.4	27.1	90.3	279.5	127.3	63.0	4.2	87.4	------	------
1934	11.9	15.1	64	6.0	.9	5.6	3.3	4.1	2.5	27.6	.3	.6	1.0	54.5	108.6	27.3	86.0	280.1	122.0	63.6	5.7	93.2	------	------
April–June:																								
1937	10.8	15.9	48	4.4	.8	1.2	1.8	2.8	1.1	17.5	.2	.6	1.7	52.2	116.7	24.9	81.4	270.0	73.0	63.3	6.6	80.3	74.1	24.0
1936	11.3	15.5	52	5.3	1.0	1.0	2.7	1.9	1.2	22.8	.1	.6	2.9	53.0	115.6	25.6	87.4	275.6	87.0	63.8	5.6	83.5	------	------
1935	10.9	15.8	53	5.5	1.2	6.2	3.0	4.9	1.4	14.3	.2	.8	2.9	54.4	115.4	23.6	83.8	255.6	84.1	66.9	7.5	82.6	------	------
1934	11.1	15.7	59	6.2	1.7	7.5	2.4	5.3	1.4	12.5	.4	.6	1.0	56.0	112.8	24.5	79.4	250.0	81.4	69.6	8.2	86.5	------	------
July–September:																								
1937	9.7	17.1	44	3.8	2.6	.4	.5	4.0	1.1	3.8	2.2	.6	.8	46.6	118.0	22.8	72.9	234.5	34.0	72.2	12.8	68.0	84.5	29.6
1936	10.3	16.8	46	4.8	2.7	.3	.7	1.8	1.2	4.6	.7	.6	1.1	49.1	115.0	22.4	79.5	239.1	36.9	76.4	13.7	71.1	------	------
1935	9.6	16.9	43	4.7	3.3	.8	1.0	2.6	1.6	4.6	1.6	.6	1.5	47.6	112.6	21.2	74.3	216.4	36.4	69.8	10.8	71.0	------	------
1934	9.9	16.9	52	5.0	4.2	1.4	.8	5.0	1.5	4.6	1.0	.9	.7	48.8	111.3	20.8	70.7	212.9	36.4	80.5	17.1	76.1	------	------
October–December:																								
1937	10.8	16.6	47	3.8	1.4	.5	1.0	2.6	2.2	11.3	.8	.5	.9	44.4	119.7	26.2	85.4	281.2	75.6	60.4	6.0	77.5	81.0	32.6
1936	11.3	16.0	56	4.4	1.9	.3	1.4	2.0	2.7	17.0	.7	.4	1.6	48.2	120.4	26.1	87.1	281.0	90.5	66.2	10.9	80.3	------	------
1935	10.9	16.2	49	4.9	2.0	.8	1.9	1.8	3.6	12.5	.7	.5	1.7	47.6	116.8	25.3	88.2	260.1	80.2	63.0	6.4	80.8	------	------
1934	10.9	16.9	55	4.7	2.6	1.0	2.0	3.5	4.1	15.3	.5	.6	.8	49.8	113.7	24.6	80.4	251.6	80.5	67.1	9.9	82.3	------	------

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[1] States included are Connecticut, District of Columbia, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Louisiana, Maryland, Michigan, Minnesota, Montana, Nebraska, New Jersey, New York, Pennsylvania, Rhode Island, South Dakota, Tennessee, Virginia, West Virginia, and Wisconsin. List includes all of the States with available data for the 4 years covered in this summary.

[2] Data not compiled by quarters prior to 1937.

TABLE 3.—*Trend of death rates for all causes, of birth rates, and of infant and maternal mortality rates, 1933–37*

RATES PROVISIONAL FOR ALL YEARS

State	Deaths, all causes (rate per 1,000 population)					Births, exclusive of stillbirths (rate per 1,000 population)					Infant mortality (rate per 1,000 live births)					Maternal mortality (rate per 1,000 live births)				
	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933
Alabama	10.7	10.9	10.1	10.2	9.5	21.4	21.3	22.0	21.8	20.6	63	66	63	68	66	5.9	6.7	6.2	6.1	6.9
California	(1)	12.5	12.1	11.5	11.6	(1)	13.9	13.3	13.2	12.8	(1)	53	50	52	53	(1)	4.7	4.7	4.4	4.8
Colorado	13.0	12.8	12.4	11.8	11.4	18.8	17.1	17.7	16.9	16.3	70	74	73	73	69	5.5	7.1	7.3	7.5	6.2
Connecticut	10.1	10.1	10.1	10.0	10.1	12.8	12.4	12.4	12.4	12.7	41	42	43	50	49	2.9	4.5	4.3	5.3	6.0
Delaware	13.8	12.8	12.5	13.2	13.2	16.4	15.1	15.8	15.8	15.7	66	64	66	61	60	4.1	7.1	6.4	5.8	6.9
District of Columbia	13.9	14.7	14.3	14.7	14.5	19.5	19.0	18.3	17.9	18.6	61	72	59	64	65	5.3	6.9	6.7	3.6	4.8
Florida	(1)	12.8	12.4	12.8	12.0	(1)	17.1	17.4	16.8	16.5	(1)	59	62	68	63	(1)	8.1	8.7	8.4	11.5
Georgia	10.8	11.9	11.0	11.4	10.1	19.9	19.4	19.9	20.8	19.5	62	70	69	80	68	7.4	7.9	7.2	7.4	7.7
Idaho	9.7	10.8	10.1	10.0	9.2	21.6	21.4	20.4	20.3	18.2	45	50	51	50	47	3.9	3.2	6.2	5.8	4.4
Illinois	11.1	11.8	10.9	11.2	10.6	14.6	14.3	14.3	14.1	13.5	43	47	46	53	51	3.8	4.2	4.7	4.8	5.0
Indiana	11.2	11.7	11.0	11.9	10.8	14.5	14.2	14.0	15.4	13.9	53	53	51	56	55	3.7	4.7	5.2	5.3	5.7
Iowa	9.7	9.9	10.3	10.5	10.1	16.5	16.7	15.8	15.9	15.2	44	42	47	53	50	4.0	4.1	5.4	5.6	4.9
Kansas	10.3	11.5	10.8	10.7	10.6	15.6	16.2	16.8	17.4	16.6	45	51	49	48	53	4.1	5.1	5.3	5.5	4.8
Kentucky	10.2	11.2	10.3	10.7	10.3	21.0	19.3	20.3	21.3	20.0	50	67	59	65	58	3.8	5.6	5.3	5.4	5.3
Louisiana	11.7	12.2	11.2	11.0	10.9	20.9	20.7	19.9	20.3	18.4	64	73	68	70	71	7.5	8.7	7.9	7.9	8.1
Maine	13.2	13.3	13.0	13.1	13.4	18.1	17.9	18.6	18.8	18.2	61	64	63	71	66	5.4	5.1	5.7	6.0	7.0
Maryland	13.2	13.1	12.7	12.6	12.4	16.4	16.0	16.4	16.6	16.7	62	68	62	69	65	4.1	4.3	5.0	5.1	4.9
Massachusetts	9.1	11.8	11.5	11.7	11.8	(1)	13.9	14.4	14.8	14.7	(1)	47	48	49	52	(1)	4.9	5.7	5.4	6.7
Michigan	11.1	11.4	10.8	10.7	10.2	19.0	18.5	18.5	17.7	16.9	48	50	47	52	51	3.6	4.7	4.9	5.3	5.5
Minnesota	10.0	10.7	9.9	10.0	9.6	17.6	16.9	16.4	16.3	15.7	42	46	46	49	50	3.1	4.4	4.9	4.8	4.5
Missouri	11.4	12.3	11.0	12.1	11.1	14.3	14.1	14.6	15.3	15.0	58	58	57	63	55	5.2	6.1	5.7	6.1	5.8
Montana	11.2	11.7	11.8	10.5	9.7	19.0	19.5	19.0	18.7	16.8	49	53	56	52	49	3.4	5.5	4.6	5.7	5.8
Nebraska	9.6	10.0	9.7	9.8	9.4	15.9	17.0	16.6	17.9	17.7	42	44	42	46	51	3.9	5.6	5.7	5.5	4.2
Nevada	12.6	14.4	13.3	13.2	12.8	15.8	14.2	14.4	14.6	14.1	49	70	71	59	73	6.9	5.6	7.7	6.3	8.1
New Jersey	10.1	10.3	10.1	10.3	10.3	12.6	12.3	12.7	12.8	13.3	39	44	47	49	46	3.4	3.8	4.5	5.4	5.1
New York	11.9	11.8	11.5	11.6	11.5	14.3	13.9	14.2	14.3	14.5	45	47	48	52	54	3.9	4.9	5.1	5.2	6.3
North Carolina	9.8	10.4	9.9	10.5	9.2	23.1	22.2	23.3	23.5	22.7	65	67	67	76	66	5.4	6.5	6.6	6.9	6.4
North Dakota	7.9	8.0	8.4	8.4	7.9	18.4	19.3	19.5	20.9	19.0	53	50	59	57	60	4.8	4.3	5.3	4.7	4.9
Ohio	11.8	12.1	11.5	11.5	10.9	15.8	15.4	15.1	14.9	14.3	50	51	50	54	53	4.6	4.9	6.2	6.0	6.1
Oklahoma	8.5	9.2	8.4	8.6	8.2	16.2	16.5	17.4	19.0	17.7	59	60	55	60	56	6.9	6.2	5.9	6.0	6.5
Oregon	12.0	12.2	11.3	10.6	10.6	15.1	13.7	13.1	13.1	12.3	42	44	41	40	40	3.5	5.4	5.4	6.1	5.5
Pennsylvania	11.1	11.0	10.6	10.8	10.6	15.8	15.7	15.8	15.8	15.6	50	50	50	54	53	4.0	4.6	4.9	5.2	5.1
Rhode Island	12.2	12.2	11.5	11.3	11.6	14.9	14.9	14.9	15.2	15.2	50	49	47	54	56	3.4	4.1	4.3	5.7	5.6
South Carolina	10.7	11.2	10.9	11.7	10.7	20.3	21.0	22.1	24.3	22.4	81	80	79	83	78	7.8	7.9	9.5	8.7	8.0
South Dakota	8.9	8.9	9.1	9.5	9.0	16.8	18.6	19.0	19.6	18.4	52	48	50	59	55	4.2	4.1	5.5	4.5	4.1
Tennessee	10.2	11.2	10.4	10.6	10.0	17.6	17.0	18.1	18.0	17.6	60	68	64	75	71	6.2	7.0	6.9	6.3	5.9
Utah	9.4	9.9	9.8	9.4	8.5	21.0	24.3	24.7	24.6	23.2	41	53	49	49	48	3.3	4.4	4.6	4.5	4.5
Vermont	11.4	13.0	12.7	13.0	12.4	14.2	17.0	17.5	17.6	16.5	45	58	49	53	53	8.1	5.0	6.8	3.9	5.7

Virginia	10.7	11.3	10.8	10.9	10.3	18.7	19.0	19.3	19.5	19.6	64	67	64	68	63	5.0	5.1	5.3	5.7	5.6
Washington	11.5	11.7	11.2	10.8	10.4	14.8	13.9	13.7	13.8	13.0	40	46	45	43	39	4.8	5.2	5.2	4.7	6.4
West Virginia	10.3	10.8	10.1	10.0	9.3	22.6	22.3	23.0	23.0	20.3	62	71	61	67	68	4.9	5.3	5.2	5.5	5.1
Wisconsin	10.9	11.3	10.5	10.4	10.0	17.9	17.7	17.6	17.2	16.8	44	47	47	50	49	3.5	4.0	3.7	4.2	4.7
Wyoming	10.6	10.3	9.8	9.1	8.6	19.6	20.4	18.8	19.8	18.3	52	58	51	53	55	3.5	5.0	4.1	6.1	5.7
Hawaii	7.9	7.8	7.8	8.3	9.6	20.0	19.7	21.7	22.4	23.8	69	73	67	75	72	4.7	4.5	4.3	5.4	5.8
Industrial policyholders, Metropolitan Life Insurance Co., ages 1 and over	8.2	8.4	5.4	8.5	8.6															

[1] Data not available.

TABLE 4.—*Trend of death rates for various causes per 100,000 population*

RATES PROVISIONAL FOR ALL YEARS

State	Typhoid and paratyphoid fever (1, 2)					Measles (7)					Scarlet fever (8)					Whooping cough (9)				
	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933
Alabama	1.9	2.7	2.9	4.6	4.2	0.1	.7	5.2	11.3	0.9	0.4	0.4	0.5	0.5	0.7	6.5	2.6	4.8	11.9	6.2
California	(1)	1.2	1.4	1.5	1.6	(1)	2.4	1.1	1.3	1.8	(1)	1.6	1.1	1.3	1.4	(1)	2.1	1.0	2.8	3.3
Colorado	3.0	3.1	3.5	4.9	5.0	.5	.7	9.9	8.3	.1	2.0	7.1	11.8	4.0	2.5	4.7	4.1	4.1	11.7	4.2
Connecticut	.3	.5	.8	.4	.5	.7	.4	1.9	.4	.5	.6	.6	1.3	.8	1.4	1.4	1.8	1.2	.9	1.6
Delaware	2.2	2.7	2.3	4.0	3.6	1.5	3.1	1.2	7.9	.4	.4	1.9	.4	2.0	.8	6.5	5.0	2.0	9.1	2.4
District of Columbia	1.9	1.6	2.7	1.4	3.3	2.1	1.3	(2)	8.6	.7	.8	.3	1.3	1.4	2.4	2.7	8.4	.5	7.0	1.3
Florida	(1)	2.5	3.8	3.0	4.3	(1)	.4	1.9	7.0	.2	(1)	.1	.1	.3	.6	(1)	1.5	3.7	7.1	2.8
Georgia	4.3	6.2	8.3	10.3	8.2	.3	.2	.9	17.5	2.0	.4	.5	.7	.5	.6	4.6	2.0	4.9	10.8	7.1
Idaho	1.8	2.5	2.5	5.3	4.3	2.8	2.3	2.1	3.4	.6	1.8	10.3	6.1	2.7	.2	3.2	1.6	6.9	3.2	.2
Illinois	.6	.9	1.2	1.7	1.4	.4	.1	3.7	2.7	.7	2.0	8.0	5.2	3.9	3.6	1.9	1.9	2.7	4.0	1.0
Indiana	1.1	1.7	1.5	3.1	2.7	.4	.1	2.6	6.6	.4	2.9	3.3	3.4	3.6	2.5	4.6	1.6	3.9	5.6	2.0
Iowa	.9	1.2	1.3	2.1	1.0	.2	.1	6.0	2.6	.2	3.8	3.1	2.8	2.4	1.8	3.3	1.4	1.7	3.8	2.5
Kansas	.9	1.7	1.6	1.4	1.5	.2	.2	12.0	1.9	.7	3.5	4.1	2.4	1.8	2.1	2.4	.9	2.8	4.8	3.2
Kentucky	5.4	7.4	8.9	10.3	11.5	2.9	2.7	8.2	6.7	4.0	1.7	1.6	2.6	2.7	2.6	8.2	2.6	9.7	10.6	4.9
Louisiana	6.3	7.0	9.2	9.8	11.6	.8	2.4	6.0	7.8	1.7	.6	.2	.4	.6	.5	6.8	4.7	3.2	10.4	5.7
Maine	1.6	.8	2.0	2.4	1.8	.4	2.5	7.0	2.3	(2)	.5	.8	1.2	1.1	1.7	3.0	2.7	3.6	11.8	1.9
Maryland	1.8	1.7	2.7	2.5	2.2	2.3	1.6	1.4	9.0	.2	.9	.7	1.7	1.6	2.4	5.8	5.1	2.6	7.5	4.9
Massachusetts	.2	.2	.3	.3	.6	.6	.8	.8	2.1	.7	.8	1.0	1.4	1.8	2.6	2.1	1.2	1.6	2.8	2.3
Michigan	.6	.8	.7	1.5	1.1	.2	.3	3.9	.7	2.3	3.0	2.4	2.0	3.7	3.4	2.7	2.2	2.8	3.1	3.2
Minnesota	.3	.5	.6	.5	.8	.3	.9	2.4	1.5	2.7	1.5	4.1	3.0	1.2	1.4	2.8	1.2	2.4	4.2	2.8
Missouri	4.2	5.2	3.7	5.7	5.2	.5	.4	3.8	8.5	1.8	2.6	2.2	1.7	2.4	2.9	4.7	1.7	4.4	6.6	2.6
Montana	2.0	1.9	2.4	3.0	2.8	.7	.6	9.2	5.5	2.6	2.0	8.7	4.0	2.1	1.9	2.6	3.0	4.3	4.7	3.0

[1] Data not available.
[2] No deaths reported.

TABLE 4.—*Trend of death rates for various causes per 100,000 population*—Continued

RATES PROVISIONAL FOR ALL YEARS

State	Typhoid and paratyphoid fever (1, 2)					Measles (7)					Scarlet fever (8)					Whooping cough (9)				
	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933
Nebraska	1.0	.9	.4	1.2	.7	.3	.7	6.2	1.6	.6	2.6	4.8	2.9	1.8	1.8	2.0	1.7	1.2	6.1	2.0
Nevada	(2)	2.0	3.0	6.1	4.2	(2)	(2)	3.0	6.1	(2)	2.0	8.0	1.0	(2)	2.1	2.0	4.0	3.0	2.0	1.0
New Jersey	.6	.7	.6	.9	1.0	1.2	.3	1.3	1.2	1.7	.3	.7	.6	1.5	1.4	1.1	1.3	2.3	1.5	1.0
New York	.5	.6	.5	.7	.9	.4	1.0	1.5	.6	2.6	.8	1.4	1.5	1.2	1.7	1.3	1.1	2.5	1.8	2.3
North Carolina	2.3	2.2	2.3	2.6	3.9	1.1	.3	2.0	9.3	2.5	.5	.7	.6	1.2	1.4	4.9	1.1	8.8	12.7	5.9
North Dakota	.4	.6	1.3	2.0	1.3	(2)	.4	7.6	3.7	4.0	1.7	4.7	4.3	1.9	1.6	1.4	.6	6.1	5.9	2.9
Ohio	1.5	1.8	1.5	2 0	1.8	1.5	.6	2.3	2.3	1.8	1.9	2.4	3.6	3.6	3.2	4.3	2.8	2.7	4.4	2.2
Oklahoma	5.3	5.2	7.5	8.4	9.9	.9	.6	1.8	15.3	2.8	1.3	1.7	.9	1.0	.9	3.3	1.6	6.2	7.4	3.3
Oregon	.8	1.7	1.5	1.7	1.8	.1	4.1	1.5	.6	1.0	1.0	1.8	2.1	2.4	2.7	2.1	2.0	1.7	3.1	1.0
Pennsylvania	1.1	1.0	.8	1.1	1.2	.8	.3	2.2	2.6	1.2	1.5	1.6	1.9	2.3	2.7	2.6	1.5	2.0	3.2	1.9
Rhode Island	.1	.4	.3	.7	.4	.4	.7	1.0	.4	(2)	1.6	1.9	.4	.6	1.3	3.1	1.0	1.2	3.2	3.8
South Carolina	6.4	10.0	10.3	11.7	10.1	.9	.4	1.3	9.7	3.4	.3	.6	.4	.5	.8	4.5	3.5	9.5	16.3	6.0
South Dakota	1.0	1.6	1.4	2.0	5.0	(2)	.3	4.0	16.9	1.0	2.9	3.6	2.7	1.4	1.6	3.0	.6	4.0	7.9	6.4
Tennessee	4.8	5.0	6.4	7.4	8.6	1.1	.8	1.3	16.0	2.8	.7	.8	1.0	1.5	1.7	4.7	2.5	13.4	9.2	5.5
Utah	.4	1.6	.8	1.4	.6	.8	1.2	6 2	11.5	.6	1.7	8.5	12.0	1.6	4.3	2.7	4.3	7.8	5.3	2.9
Vermont	1.0	1.6	1.1	2.1	.8	(2)	5.8	1.6	.8	.3	.3	.8	2.1	1.6	2.2	.8	2.6	3.4	4.5	3.2
Virginia	1.9	2.7	2.8	3.1	4.2	2.4	1.1	5.1	5.8	2.0	.2	.5	.9	1.7	2.0	7.8	4.4	7.5	7.8	4.2
Washington	.7	1.1	1.0	1.7	1.5	.8	2.0	1.5	.9	.6	1.0	1.5	1.5	1.6	.9	1.9	.8	1.9	2.6	.2
West Virginia	4.4	4.2	5.3	6.9	8.0	2.1	1.6	6.4	3 4	2.5	1.9	2.2	4.5	4.4	2.5	13.1	3.9	6.9	11.8	6.0
Wisconsin	.4	.4	.3	.6	.5	.2	.4	2.5	2.3	.9	2.3	4.4	3.8	1.8	1.3	2.2	1.4	1.8	3.6	2.0
Wyoming	1 3	.4	2.6	2.2	4.8	.4	(2)	13.4	4.8	.9	3.8	9.4	11.2	3.0	2.2	5.1	1.3	6.9	3.0	4.3
Hawaii	1.6	2.0	2.4	3.1	5.3	41.7	6.2	(2)	.2	.5	(2)	(2)	(2)	(2)	(2)	2.2	.4	2.6	13.3	12.4
Industrial policyholders, Metropolitan Life Insurance Co., ages 1 and over	.9	1.0	1.1	1.5	1.6	1.0	.9	2.5	2.7	1.5	1.6	2.1	2.6	2.6	2.6	3.0	1.7	2.7	3.7	2.3

State	Diphtheria (10)					Encephalitis, epidemic or lethargic (17)					Acute poliomyelitis and polioencephalitis (16)					Epidemic cerebrospinal meningitis (18)				
	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933
Alabama	3.4	4.0	4.5	5.7	5.0	0.4	0.3	0.7	0.5	1.1	0.6	1.3	0.5	0.6	0.4	3.9	0.9	0.8	0.4	0.4
California	(1)	2.1	2.2	1.8	2.0	(1)	.6	.4	.4	.5	(1)	.6	1.1	1.8	.2	(1)	2.1	2.1	.8	1.3
Colorado	3 2	3.4	4.0	3.3	1.7	1.0	1.0	.7	.8	1.7	4.5	1.4	1.1	.4	.4	3.1	2.8	2.2	1.6	2.2
Connecticut	1.4	.4	1.0	.4	1.0	.4	.2	.3	.3	.8	.4	.1	1.3	.1	.2	.7	.7	1.0	.4	.5
Delaware	.4	1.2	2.0	1.6	2.8	.4	.4	.4	1.6	1.2	.4	.4	.4	(2)	.4	1.5	1.2	.8	.4	.4

District of Columbia	2.2	4.5	4.7	2.7	2.6	.8	.6	.8	.5	.4	.6	.3	1.7	.5	.4	4.8	10.5	15.8	.9	2.0
Florida	(1)	3.5	3.7	5.5	3.7	(1)	.5	.1	.3	.6	(1)	.4	.4	.2	.4	(1)	3.7	.8	.5	.9
Georgia	3.4	3.8	5.2	6.0	6.0	.2	.3	.1	.3	.3	.6	.9	.5	.7	.7	1.2	2.1	1.0	.6	.4
Idaho	1.2	.6	.6	2.7	1.7	.8	1.2	2.5	1.9	(2)	.4	1.0	.8	3.2	.8	1.0	6.0	4.6	2.7	1.5
Illinois	1.9	2.2	2.6	2.0	1.7	.4	.4	.5	1.1	1.3	1.1	.9	.5	.4	.4	1.2	2.2	2.6	1.5	2.7
Indiana	1.5	2.9	4.0	3.5	4.3	.5	.6	.7	1.0	1.4	.8	.4	.3	.6	.3	1.5	2.1	2.5	.6	1.4
Iowa	.4	.9	2.1	1.6	2.1	.6	.5	.7	.8	1.4	1.5	.5	.4	.3	1.6	1.0	2.0	2.0	1.1	1.4
Kansas	1.3	2.3	2.1	2.2	2.9	1.2	1.1	1.4	1.4	2.8	1.9	.6	.5	.6	.7	1.3	1.1	2.2	1.1	1.1
Kentucky	4.6	5.1	8.3	11.5	15.3	.7	.8	.5	.7	1.0	1.1	1.2	1.6	1.4	1.0	2.9	6.2	2.6	1.6	1.4
Louisiana	3.3	4.4	5.2	4.5	4.8	.3	.2	.4	.4	.2	.9	.4	.6	.2	.4	1.3	1.8	1.0	.7	1.2
Maine	.6	.8	1.1	.8	1.7	.2	.2	.5	.5	1.0	1.8	.4	1.7	.6	.8	1.1	.9	.5	.7	.5
Maryland	1.3	1.6	1.3	1.4	1.8	1.5	1.1	.8	.8	.7	1.0	.1	.2	.4	.2	2.7	7.1	5.2	.2	1.1
Massachusetts	.4	.6	.7	1.2	2.0	.3	.3	.5	.6	.6	.5	.2	1.4	.3	.7	1.5	2.3	1.2	.6	.7
Michigan	1.5	1.1	1.2	.8	2.4	.2	.4	.3	.3	.6	1.0	.4	.7	.5	.1	.8	1.2	.9	.6	.6
Minnesota	.5	.6	.6	.7	1.0	.9	.6	.9	1.3	1.3	1.9	.2	.4	.8	1.3	.9	1.9	1.7	.8	1.2
Missouri	2.3	2.0	4.6	5.3	6.1	3.7	.8	1.0	1.3	7.8	1.9	.6	.4	.4	.4	1.2	2.0	2.9	1.4	1.5
Montana	1.5	2.1	2.8	1.9	3.0	.9	.4	.9	.9	.9	1.3	.6	.2	3.2	.4	1.3	4.3	2.6	1.7	.6
Nebraska	1.1	1.5	1.2	1.7	1.5	.9	.4	.5	.3	1.4	3.2	.7	.7	.7	.3	1.1	1.4	2.8	1.3	.6
Nevada	(2)	1.0	(2)	1.0	4.2	(2)	1.0	1.0	1.0	2.1	(2)	(2)	(2)	1.0	1.0	1.0	4.0	2.0	(2)	1.0
New Jersey	.7	.5	1.1	1.3	1.2	.6	.8	.6	.7	.9	.5	.2	.8	.3	.6	1.1	1.8	.7	.5	.6
New York	.6	.5	.8	1.0	1.2	.7	.5	.6	.5	.7	.4	.1	1.1	.4	1.1	1.2	2.2	2.2	.7	.8
North Carolina	4.8	5.5	4.6	6.2	5.9	.4	.4	.4	.5	.4	.6	.3	2.0	.4	.4	1.2	1.6	.8	.4	.3
North Dakota	1.6	1.6	3.0	3.0	2.9	.6	.7	1.1	.9	1.0	(2)	.4	.4	.6	1.3	1.8	1.0	1.0	2.3	2.7
Ohio	1.6	1.6	2.7	2.9	2.6	1.0	.8	1.0	1.0	1.0	.8	.8	.5	.5	.8	1.4	2.4	3.3	1.2	.6
Oklahoma	3.8	3.5	5.7	5.9	10.6	.3	.7	.3	.3	.6	2.3	1.4	.4	.8	1.1	1.9	3.7	2.7	1.2	2.1
Oregon	.8	.9	.5	.7	.9	1.2	1.9	1.7	1.9	.9	.7	.9	1.6	.8	1.0	.7	1.5	2.8	.3	.6
Pennsylvania	1.0	1.3	1.5	2.2	2.3	.6	.6	.7	.6	.7	.4	.2	.3	.3	.6	1.3	1.2	1.2	.7	.9
Rhode Island	.4	.1	.7	.3	1.3	.3	.3	.1	.1	.7	(2)	(2)	3.5	.1	.1	2.2	3.1	2.3	.7	.4
South Carolina	3.5	4.0	3.7	4.4	5.0	.3	.2	.4	.6	1.7	.7	.9	.7	.4	.7	1.0	2.5	1.3	.4	1.9
South Dakota	.7	.7	1.7	1.0	2.3	1.2	.3	.6	.3	.6	1.2	.1	1.0	1.4	.9	1.0	.6	.4	.4	.1
Tennessee	4.7	5.3	6.4	7.3	7.9	.8	.9	.5	.9	.8	1.2	1.5	.8	1.2	1.2	2.4	3.6	3.8	1.4	.9
Utah	1.2	1.0	1.4	.4	.6	1.0	.6	.6	1.2	1.9	1.3	.2	.2	.6	.6	1.7	3.5	1.9	1.4	2.5
Vermont	.5	(2)	1.1	.5	.8	(2)	.5	.5	(2)	.8	.5	(2)	1.9	(2)	1.3	2.3	1.6	2.1	.8	.5
Virginia	3.1	3.8	4.3	5.6	6.0	.6	.4	.5	.6	.4	.5	.4	1.6	.7	.4	4.0	5.2	3.8	1.4	.9
Washington	.9	.4	.7	.5	1.5	1.9	2.4	1.6	1.7	1.1	.5	1.0	.6	3.4	1.0	1.3	1.5	2.1	1.0	1.1
West Virginia	4.8	7.1	8.7	9.4	10.6	.2	.5	.6	.5	.3	1.1	1.2	.6	.9	1.2	4.4	5.8	3.6	2.1	.9
Wisconsin	.8	.5	.4	.9	.6	.5	.8	.8	.5	.6	1.3	.1	.2	.6	.4	.7	1.0	1.2	.7	.5
Wyoming	(2)	3.9	.9	1.7	.9	1.7	.8	1.3	1.7	.4	3.0	.4	9	.9	(2)	2.6	2.1	2.6	2.2	1.7
Hawaii	2.4	1.6	.7	.5	1.8	.2	.7	.2	.2	(2)	.4	.2	(2)	.2	.5	.4	1.6	.7	1.9	.8
Industrial policyholders, Metropolitan Life Insurance Co., ages 1 and over	1.9	1.8	2.2	2.1	2.6	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------

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[1] Data not available.

[2] No deaths reported.

TABLE 4.—*Trend of death rates for various causes per 100,000 population*—Continued

RATES PROVISIONAL FOR ALL YEARS

State	Influenza (11)					Pneumonia, all forms (107–109)					Malaria (38)*					Pellagra (62)*				
	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933
Alabama	49.9	48.5	44.3	26.1	31.8	90.2	97.8	85.7	78.8	57.6	7.9	12.2	11.4	10.4	9.6	10.7	10.7	9.1	11.1	13.4
California	(1)	11.8	8.9	5.4	14.2	(1)	72.3	63.7	56.0	63.5	(1)	(1)	.1	.1	.1	(1)	(1)	1.5	.8	.6
Colorado	49.2	32.5	32.5	25.5	36.1	167.3	131.3	113.2	107.3	95.2	------	------	.1	------	.2	.2	.5	.5	.2	.1
Connecticut	11.7	8.0	8.6	7.2	21.0	67.0	70.3	65.1	62.2	71.6	------	------	.1	------	.1	.3	.3	.1	.2	.4
Delaware	22.6	10.8	15.6	15.8	16.4	96.2	84.6	91.8	94.9	94.0	------	------	------	------	------	------	------	.4	.8	.4
District of Columbia	15.6	7.6	11.4	6.8	9.0	121.4	138.9	127.3	116.8	105.3	------	------	.7	.2	.2	.8	.5	1.3	2.1	1.3
Florida	(1)	53.5	39.2	25.6	39.4	(1)	85.5	67.8	76.0	57.0	(1)	21.0	20.2	28.5	24.5	(1)	8.1	11.1	14.3	12.2
Georgia	44.6	58.9	43.0	31.9	40.5	93.7	120.3	95.8	97.2	74.3	6.9	20.0	12.6	13.6	12.3	11.7	12.6	12.1	11.6	14.0
Idaho	39.6	19.0	17.1	14.0	18.0	77.3	110.5	95.6	97.3	70.0	------	------	.4	------	------	------	.2	------	------	------
Illinois	16.9	14.5	15.7	10.8	15.5	70.0	80.4	77.9	75.8	63.8	.5	(1)	.8	.7	.8	.2	(1)	.2	.3	.3
Indiana	32.3	28.1	24.7	21.9	29.3	91.7	97.0	86.4	83.3	65.0	.6	.1	.3	.5	.5	.5	.5	.2	.2	.2
Iowa	32.2	19.9	21.0	17.6	32.9	64.4	71.2	76.2	75.8	73.2	.1	.1	(3)	(3)	.2	.2	(3)	(3)	.1	.1
Kansas	34.0	47.3	31.2	19.5	46.5	59.5	84.3	79.4	59.2	54.2	.2	.3	.3	.3	.2	.4	.7	.3	.2	.4
Kentucky	48.2	43.3	28.8	22.8	37.3	89.2	104.4	83.9	84.8	70.6	1.3	1.8	2.5	2.2	2.9	2.6	3.1	2.6	2.2	3.4
Louisiana	53.6	49.5	24.2	20.5	33.0	105.7	120.0	87.2	74.3	65.2	8.4	11.7	17.0	17.1	20.2	4.6	5.5	6.3	6.7	9.2
Maine	37.5	24.9	20.2	18.9	41.4	93.5	96.4	84.3	83.1	75.9	------	------	.1	------	------	.1	.1	.5	.5	.5
Maryland	17.3	11.7	14.7	9.0	17.6	108.8	111.0	100.7	99.0	95.7	.1	.1	.2	.1	.1	.4	.5	.8	.6	.7
Massachusetts	9.5	6.3	7.3	6.3	13.8	92.0	88.1	89.5	82.3	91.4	(3)	------	(3)	(3)	------	.3	.3	.4	.3	.2
Michigan	17.7	12.0	15.1	11.4	18.1	84.9	85.4	80.4	73.8	58.1	------	.1	.2	.1	(3)	(3)	.1	.2	.1	.1
Minnesota	23.8	14.2	15.8	14.5	24.4	74.8	85.0	76.5	80.9	58.6	------	(3)	.1	------	(3)	.1	.1	.2	.2	(3)
Missouri	34.4	38.7	24.0	19.2	33.4	110.1	116.7	98.8	100.1	82.0	2.3	2.6	4.2	4.8	5.2	.5	.9	.4	.5	.7
Montana	55.5	24.3	42.0	26.7	36.0	104.1	121.5	122.8	82 5	63.8	------	.2	------	.2	------	.2	.2	------	------	------
Nebraska	41.1	21.3	22.7	17.8	35.1	60.8	72.0	78.2	74.9	71.3	------	------	.2	.1	.1	.2	.1	.1	.1	------
Nevada	8.9	26.0	21.2	12.2	26.0	124.8	148.0	108.1	102.0	86.5	------	------	------	------	1.0	1.0	------	------	3.1	------
New Jersey	10.0	7.9	9.2	7.3	12.2	66.4	67.7	63.2	65.9	71.1	------	(3)	.2	------	(3)	.2	.2	.1	.3	.2
New York	10.1	6.5	6.8	7.0	13.4	87.6	88.9	85.4	88.0	94.4	.2	.1	.1	.2	.1	.2	.2	.2	.2	.2
North Carolina	25.1	32.2	28.3	21.1	28.2	84.3	100.7	90.4	99.8	63.7	2.7	4.3	2.7	2.0	1.5	9.4	10.2	11.2	13.0	11.8
North Dakota	27.5	12.7	23.9	20.8	38.7	67.1	55.6	93.3	79.5	58.7	------	------	.1	.1	------	------	------	------	.3	------
Ohio	30.1	20.0	24.5	17.5	22.3	86.0	87.1	79.0	77.4	59.9	------	.1	.1	.1	.1	(3)	.4	.4	.4	.3
Oklahoma	40.1	46.1	30.8	22.0	36.6	72.4	91.5	79.3	76.2	69.3	3.3	3.7	5.5	5.6	5.4	4.0	6.9	5.1	4.2	4.4
Oregon	28.7	19.8	16.8	12.6	20.5	62.8	93.3	60.9	47.3	48.4	.2	.1	------	------	------	.1	.2	.1	.2	.2
Pennsylvania	26.6	16.1	18.1	15.1	25.1	76.5	82.5	80.0	80.0	69.8	.1	.1	(3)	(3)	(3)	.1	.1	.1	.3	.1
Rhode Island	11.0	9.1	8.5	7.9	18.2	94.7	95.9	79.4	74.9	79.5	------	------	------	------	------	.1	.1	.3	.1	.4
South Carolina	42.5	49.8	44.2	41.1	36.3	91.9	87.4	89.7	95.1	84.7	14.0	(1)	23.4	19.4	13.5	14.4	(1)	16.2	18.8	18.2
South Dakota	38.7	20.2	31.6	29.6	45.8	70.1	66.2	96.1	85.1	62.0	------	------	------	------	------	------	.1	------	.1	.1
Tennessee	44.9	54.4	39.9	34.2	38.4	93.3	117.3	95.4	89.2	75.0	3.6	(1)	7.8	9.5	10.0	6.9	(1)	7.6	8.2	8.4
Utah	24.1	21.5	22.7	16.3	23.4	63.8	95.7	92.9	93.6	61.2	------	------	.2	------	------	.2	------	.2	------	.2
Vermont	30.0	31.1	35.0	23.0	40.4	97.1	111.8	99.4	81.6	72.8	------	------	------	------	------	.3	------	.8	------	------
Virginia	38.7	38.0	35.2	25.4	35.4	94.6	94.0	78.7	74.3	63.4	.3	.6	.6	.4	.4	3.8	4.9	5.3	4.8	4.6

Washington	24.2	26.0	16.2	13.7	20.2	69.7	76.9	56.8	54.2	49.0	------	------	------	.1	------	.2	.3	.1	.1	.3
West Virginia	42.1	33.8	31.1	26.4	33.5	92.1	109.3	84.1	79.1	64.2	.1	.1	.2	.1	.1	------	.5	.7	.7	.4
Wisconsin	39.4	15.9	19.3	12.0	26.2	67.7	77.0	65.5	69.8	52.7	------	.1	(2)	------	------	.1	.1	------	.1	.1
Wyoming	46.0	24.0	26.7	16.9	28.3	115.3	113.3	91.8	55.0	47.9	------	------	.4	------	------	------	------	------	------	------
Hawaii	8.2	11.9	13.2	13.7	7.4	83.5	68.0	69.1	110.4	97.8	------	(1)	------	------	------	.4	(1)	------	------	------
Industrial policyholders, Metropolitan Life Insurance Co., ages 1 and over	18.0	14.7	14.7	11.4	20.3	66.3	69.8	66.1	65.0	62.5	------	------	------	------	------	------	------	------	------	------

State	Tuberculosis, all forms (23–32)					Cancer, all forms (45–53)					Diabetes mellitus (59)					Cerebral hemorrhage, apoplexy (82a,b)				
	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933
Alabama	60.4	63.9	61.2	61.1	67.3	57.2	59.2	60.3	54.0	54.4	10.4	12.3	9.1	10.4	9.4	67.0	69.2	66.2	60.0	55.2
California	(1)	76.2	75.3	77.7	78.6	(1)	144.9	140.6	134.2	130.6	(1)	24.0	25.0	22.3	23.2	(1)	85.1	84.7	89.3	84.9
Colorado	65.9	76.2	76.8	77.5	85.2	113.9	116.7	112.2	110.1	103.6	16.5	18.4	16.1	13.8	13.1	85.6	84.5	80.6	82.0	79.1
Connecticut	36.5	38.6	41.9	41.4	46.3	125.8	125.1	126.4	124.7	123.8	30.6	28.3	29.8	25.2	24.1	85.4	83.3	84.3	83.3	83.0
Delaware	55.6	49.4	62.5	62.1	72.0	118.8	122.0	114.1	112.6	119.6	29.9	29.3	30.5	28.9	28.8	113.8	113.9	101.4	113.8	120.0
District of Columbia	88.5	106.6	102.2	108.7	113.6	139.1	136.7	131.0	135.3	136.3	23.7	26.7	23.1	33.6	23.9	95.2	103.6	99.5	95.5	107.0
Florida	(1)	54.6	55.5	60.0	66.8	(1)	88.4	87.9	83.5	81.8	(1)	18.6	19.5	17.0	15.8	(1)	105.3	95.1	102.0	94.3
Georgia	49.3	55.1	55.7	57.2	58.4	57.1	56.0	54.8	56.8	53.6	12.0	12.5	12.3	12.6	11.4	82.1	82.7	73.7	74.1	79.5
Idaho	20.7	24.5	24.6	27.3	29.8	83.4	79.6	66.8	71.5	79.4	12.6	13.6	14.2	12.5	10.3	70.0	73.6	66.2	68.1	71.9
Illinois	50.7	51.6	52.1	52.7	53.8	131.2	131.1	128.4	123.7	118.6	27.1	29.2	25.3	28.0	26.3	71.6	79.1	72.8	71.9	73.0
Indiana	45.4	47.0	46.2	51.4	53.6	106.7	108.0	109.9	112.2	102.3	14.5	16.4	15.5	18.2	14.2	119.7	127.4	121.8	123.3	103.6
Iowa	20.2	22.2	25.7	24.5	25.3	124.3	120.8	128.2	123.9	121.5	21.4	23.2	21.5	24.6	19.2	103.4	105.2	105.7	108.6	110.7
Kansas	26.6	29.0	28.8	27.4	30.8	115.6	117.2	111.2	115.1	109.6	23.3	22.9	22.2	24.1	23.6	97.8	102.7	98.9	98.6	101.2
Kentucky	68.8	71.6	69.7	74.4	83.7	68.1	74.6	71.0	73.6	73.9	10.5	15.1	14.5	15.2	14.0	87.3	83.9	78.4	78.6	72.7
Louisiana	71.0	72.6	72.2	76.2	74.2	81.9	80.7	80.3	73.3	73.0	18.0	17.5	15.8	13.5	14.3	68.2	72.1	63.9	58.1	61.6
Maine	31.5	39.8	35.4	36.2	44.3	143.3	151.3	148.5	140.6	141.7	23.4	28.1	27.7	28.4	28.7	127.2	126.2	123.6	129.3	129.2
Maryland	83.4	82.9	81.1	80.2	82.2	134.4	123.7	130.3	127.6	121.0	26.3	27.5	26.8	23.9	24.0	108.1	110.6	112.3	104.8	97.0
Massachusetts	41.2	43.8	46.3	48.8	52.8	147.9	153.0	147.7	153.6	147.3	33.4	31.4	29.7	30.3	28.2	95.1	96.2	95.3	95.9	97.4
Michigan	43.9	43.9	43.2	46.9	49.6	114.4	115.7	109.6	109.9	103.5	25.9	26.5	26.0	23.5	23.3	86.9	94.8	89.1	91.5	88.9
Minnesota	33.9	35.6	34.6	34.7	37.7	140.6	133.5	131.1	130.0	130.4	23.8	25.8	22.1	22.5	20.6	86.4	86.5	82.7	81.9	79.4
Missouri	54.5	58.2	55.2	57.2	59.8	117.8	118.0	117.5	118.6	109.1	21.4	22.6	20.7	23.0	22.4	90.6	91.2	78.2	86.1	81.7
Montana	43.6	41.2	46.9	49.7	50.6	107.2	106.0	97.4	88.5	92.1	20.2	22.4	19.8	20.0	15.8	85.7	92.1	83.6	76.3	70.2
Nebraska	19.1	18.0	22.4	22.2	22.0	112.2	113.0	108.5	111.5	103.1	26.0	24.8	20.5	20.3	16.6	88.3	113.0	99.3	97.9	96.6
Nevada	85.1	88.0	108.1	90.9	91.6	70.3	95.0	89.9	95.0	85.4	13.9	13.0	13.1	17.3	16.7	74.2	69.0	87.8	69.4	88.5
New Jersey	46.4	50.2	50.1	52.6	56.5	121.8	127.4	123.8	122.7	119.2	30.3	30.6	28.6	27.3	28.9	76.3	80.8	75.9	80.5	82.0
New York	57.1	58.4	57.3	58.7	61.2	150.5	147.3	143.3	136.7	131.8	37.0	36.3	32.7	32.2	31.4	74.6	78.7	77.3	68.2	62.2
North Carolina	54.1	60.6	56.6	61.9	63.2	54.1	51.8	50.6	49.9	49.1	10.9	11.6	10.1	11.1	10.5	79.2	91.2	80.7	80.5	71.6
North Dakota	25.9	24.9	25.1	24.6	24.3	80.7	83.5	79.7	83.8	75.9	17.6	18.8	18.6	19.7	20.1	67.4	67.6	58.3	62.2	53.6
Ohio	49.4	52.9	53.8	52.5	54.5	121.3	126.4	123.3	120.4	113.9	26.4	27.4	25.9	25.1	23.8	107.8	113.8	109.2	109.8	102.8
Oklahoma	48.3	51.2	46.1	46.6	49.0	71.8	67.6	60.5	63.0	60.9	12.8	14.6	12.3	12.0	10.6	62.2	63.9	60.3	59.6	57.3
Oregon	33.9	36.5	34.5	35.7	35.4	121.5	135.1	122.9	130.2	127.8	25.0	23.3	25.0	20.5	22.4	101.9	103.4	108.0	100.3	98.8

*Leaders indicate no deaths reported.

[1] Data not available.

[2] Less than 1/10 of 1 per 100,000 population.

TABLE 4.—*Trend of death rates for various causes per 100,000 population*—Continued

RATES PROVISIONAL FOR ALL YEARS

State	Tuberculosis, all forms (23–32)					Cancer, all forms (45–53)					Diabetes mellitus (59)					Cerebral hemorrhage, apoplexy (82a,b)				
	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933
Pennsylvania	45.3	44.4	44.4	47.2	48.4	115.0	112.0	107.0	107.0	102.8	30.8	27.4	27.2	26.9	25.7	79.4	86.5	81.3	81.3	82.3
Rhode Island	46.8	47.9	51.0	46.3	51.7	156.2	145.2	147.3	137.3	140.4	42.1	33.8	33.3	33.6	35.6	98.4	98.4	96.2	92.7	99.1
South Carolina	50.4	53.2	54.3	61.0	57.3	50.3	49.4	49.1	52.7	46.7	11.5	11.0	12.2	11.9	8.0	93.5	106.2	84.3	88.8	77.5
South Dakota	37.3	34.4	39.3	34.4	38.9	84.0	88.4	89.7	85.8	83.7	19.6	21.4	19.6	22.5	19.9	69.4	81.9	78.9	74.1	79.5
Tennessee	83.0	87.5	84.3	86.7	89.8	67.3	65.8	64.6	63.0	58.2	11.2	11.3	11.5	10.6	10.2	78.8	80.3	77.4	76.8	64.6
Utah	20.4	21.5	17.5	21.4	21.8	91.3	81.2	85.2	79.6	78.4	19.1	20.3	17.9	17.5	13.5	60.3	50.0	52.8	49.2	49.7
Vermont	47.2	42.6	42.0	50.8	47.5	137.6	137.0	139.5	125.1	127.8	18.8	25.5	30.8	37.2	28.6	96.9	115.2	120.1	127.8	108.7
Virginia	60.5	66.6	69.1	68.4	73.6	70.9	71.1	72.1	70.0	68.8	16.0	15.4	15.2	16.2	14.1	88.8	95.7	95.1	90.1	92.0
Washington	46.3	49.8	51.6	47.4	53.3	132.0	133.3	132.2	128.5	120.9	23.5	25.3	23.3	21.5	22.0	102.2	103.8	98.7	94.9	92.7
West Virginia	52.5	54.4	57.3	53.7	53.3	73.6	70.6	70.9	67.0	67.0	15.1	14.6	13.4	11.3	11.3	74.0	78.6	71.2	78.6	68.0
Wisconsin	34.8	36.2	36.5	38.4	41.7	133.2	132.5	128.7	126.2	119.3	26.5	29.7	25.8	24.8	24.2	91.1	93.0	88.4	88.1	87.1
Wyoming	18.7	18.0	25.0	18.6	30.4	76.6	73.8	67.2	74.9	71.7	11.1	15.4	17.2	10.4	13.5	84.2	74.2	65.9	64.1	53.0
Hawaii	70.8	78.0	68.5	76.9	99.6	66.5	62.9	62.1	57.1	68.6	15.6	16.9	15.1	15.7	15.8	40.6	43.7	39.8	36.0	49.7
Industrial policyholders, Metropolitan Life Insurance Co., ages 1 and over	51.3	54.3	55.8	59.4	64.7	94.1	93.9	96.1	96.1	94.6	25.0	24.7	24.4	24.4	24.1	59.0	61.9	61.2	63.2	63.8

State	Diseases of the heart (90–95)					Nephritis, all forms (130–132)					Diseases of the digestive system (115–129)					Diarrhea and enteritis under 2 years (119)				
	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933
Alabama	161.9	147.4	135.8	142.2	121.4	78.0	79.3	79.9	77.6	76.3	64.1	68.0	61.8	72.9	69.0	15.5	17.5	15.2	19.9	18.2
California	(1)	333.6	320.5	293.8	282.4	(1)	83.4	82.6	78.9	80.9	(1)	84.2	77.8	75.4	71.7	(1)	10.4	7.4	9.4	8.7
Colorado	210.0	250.0	240.1	211.4	202.7	79.5	84.3	78.8	83.3	63.0	83.1	101.7	100.5	101.7	95.8	26.6	23.6	17.2	20.7	17.9
Connecticut	234.6	238.4	221.7	213.8	205.3	77.5	84.8	86.8	85.6	83.5	47.6	51.3	56.1	56.0	57.2	3.0	2.6	1.7	5.0	4.6
Delaware	363.6	346.3	331.3	354.5	333.2	136.0	119.3	111.4	119.0	146.8	72.0	68.3	69.9	75.1	72.8	9.6	15.4	19.1	13.8	14.0
District of Columbia	327.1	335.4	330.6	347.3	312.0	98.2	96.9	100.7	111.6	117.5	79.9	84.2	90.2	93.2	102.4	11.6	15.0	9.9	12.7	10.5
Florida	(1)	233.4	214.7	222.9	194.9	(1)	104.4	104.8	118.3	115.1	(1)	85.4	93.2	93.9	83.6	(1)	9.5	12.8	13.6	8.3
Georgia	167.3	150.1	163.7	161.8	130.6	107.7	108.3	100.8	105.5	102.3	67.2	72.6	72.5	80.3	70.7	15.2	17.5	15.8	21.3	16.2
Idaho	150.7	156.4	159.1	149.9	155.6	37.5	25.2	34.9	34.2	33.9	71.8	64.7	60.5	74.8	58.8	9.1	7.2	4.4	11.0	6.7
Illinois	301.5	317.6	276.7	270.0	256.6	95.4	102.0	96.8	104.7	103.5	68.9	72.6	69.1	75.9	71.1	4.5	6.5	4.4	8.4	6.4
Indiana	213.9	265.5	254.2	264.4	173.0	63.4	74.3	64.7	75.1	71.5	------	------	------	------	------	8.5	8.9	6.3	12.0	10.7
Iowa	220.5	231.7	225.7	206.4	193.9	58.3	59.9	62.3	65.6	40.5	54.8	56.9	61.0	65.4	55.8	3.4	4.4	3.9	6.8	2.7
Kansas	224.8	241.5	217.0	207.4	196.8	87.2	97.1	92.4	96.5	95.2	62.5	72.2	70.7	79.3	74.2	6.1	6.8	6.5	8.3	8.7

Kentucky	165.2	207.1	185.3	183.5	162.1	66.0	76.2	72.8	80.1	78.5	71.9	84.0	74.9	87.5	80.9	22.2	30.0	21.7	29.4	24.1
Louisiana	211.6	232.0	206.7	202.4	191.2	104.3	105.4	105.8	110.1	97.5	74.8	84.8	82.7	80.4	78.8	16.5	18.2	17.8	22.0	19.4
Maine	359.5	344.4	326.4	308.5	315.2	81.3	87.1	87.1	87.1	96.6	59.0	66.2	78.3	73.4	70.9	14.0	6.0	12.9	11.8	9.3
Maryland	313.8	304.6	273.5	270.7	261.0	138.6	142.4	137.4	141.1	147.2	69.0	70.3	70.8	71.1	72.5	13.8	16.1	14.0	17.7	17.1
Massachusetts	359.2	358.7	337.1	331.8	327.2	69.0	73.5	76.3	78.7	82.1	59.2	61.5	61.1	65.1	63.9	2.7	3.5	5.2	4.7	4.0
Michigan	272.8	278.9	262.8	251.0	242.2	60.6	63.5	62.9	66.1	63.6	65.6	75.2	67.3	74.6	69.0	5.8	9.8	4.5	8.2	6.2
Minnesota	232.4	244.0	213.9	213.0	197.2	45.4	48.1	48.4	51.7	54.5	56.0	62.2	63.2	68.3	61.4	2.8	4.6	3.8	4.0	4.9
Missouri	254.2	260.3	229.7	240.3	227.3	99.3	115.6	111.4	116.3	108.8	62.2	84.6	73.0	89.6	78.8	10.9	15.1	11.6	16.4	13.5
Montana	220.8	193.8	205.5	179.3	180.1	58.1	65.3	66.8	65.9	69.2	73.5	88.5	94.0	84.2	74.7	7.0	11.5	8.1	13.4	5.1
Nebraska	219.9	220.6	159.7	159.6	178.9	63.1	69.6	51.5	60.6	58.3	61.4	74.6	65.6	72.7	65.3	4.0	4.8	3.7	5.6	4.8
Nevada	255.4	290.0	218.2	249.0	249.0	46.5	84.0	100.0	83.7	91.7	72.3	104.0	104.1	100.1	103.2	5.0	7.0	7.1	18.4	10.4
New Jersey	305.8	301.9	285.1	284.6	268.0	70.3	75.6	79.0	82.6	85.7	57.2	58.2	57.0	59.3	62.4	3.2	3.4	3.4	5.2	4.3
New York	360.9	319.8	318.4	322.6	299.1	75.5	78.7	80.3	84.5	79.1	67.6	68.3	67.0	69.4	71.3	5.9	6.1	6.2	6.8	7.0
North Carolina	158.3	175.1	155.7	161.2	141.4	84.5	95.1	90.5	98.5	87.2	71.0	64.9	63.9	73.3	65.7	24.6	23.5	22.0	26.6	20.6
North Dakota	163.7	160.6	146.0	154.4	143.0	35.6	41.7	47.4	41.0	47.3	54.8	67.5	65.5	74.7	63.8	10.0	12.2	10.4	14.8	12.1
Ohio	254.9	252.8	262.8	255.4	240.8	78.8	81.4	81.5	81.9	78.5	67.6	73.2	69.2	74.8	73.2	8.2	8.3	6.0	8.0	8.5
Oklahoma	129.5	138.9	124.4	112.0	114.2	61.8	58.0	52.6	49.1	44.7	65.1	70.7	67.0	77.8	74.4	13.0	15.3	13.1	18.3	16.8
Oregon	273.3	277.4	277.5	254.0	255.2	106.6	104.3	103.7	91.6	87.2	52.3	66.2	63.0	59.7	57.8	1.6	2.3	1.8	1.7	1.6
Pennsylvania	301.9	292.8	271.7	263.3	244.9	84.5	82.0	83.1	88.7	92.6	55.5	53.7	55.7	60.7	62.2	6.0	5.8	5.5	8.3	8.6
Rhode Island	365.0	355.1	323.3	312.3	239.3	108.5	107.2	103.8	111.7	117.0	60.6	61.2	66.2	62.7	68.2	5.1	3.8	5.3	4.3	4.4
South Carolina	185.2	177.8	178.4	168.6	160.9	92.0	93.8	93.5	109.0	81.8	29.8	41.6	63.2	75.2	70.2	9.8	16.2	22.1	27.8	23.8
South Dakota	167.0	153.6	139.6	146.0	147.4	44.1	60.5	61.1	63.0	50.9	54.5	60.4	59.0	66.2	57.9	4.6	10.1	7.8	9.4	8.2
Tennessee	158.0	161.3	142.6	144.0	111.1	65.2	67.9	63.1	62.0	60.5	75.2	80.3	77.9	87.8	85.0	17.6	20.4	18.9	25.4	23.3
Utah	227.9	218.4	202.5	193.8	176.2	57.2	58.5	58.3	58.8	55.4	67.8	78.0	80.6	80.4	78.6	3.8	9.9	4.9	9.3	5.3
Vermont	311.2	356.3	313.0	330.2	314.3	72.6	88.2	88.3	101.6	94.6	47.8	69.2	63.9	71.3	75.9	2.6	5.3	3.4	5.0	4.6
Virginia	219.2	231.4	203.0	205.8	183.3	83.5	91.5	86.3	87.3	85.0	51.7	57.8	55.4	62.1	58.4	12.3	13.3	10.8	16.2	15.3
Washington	301.9	277.0	264.6	214.3	236.0	75.3	74.3	79.2	75.2	71.9	57.8	66.3	65.3	63.1	61.5	3.2	3.3	3.7	2.8	2.5
West Virginia	166.2	170.5	150.2	124.3	116.2	63.4	67.3	69.5	64.9	78.0	71.6	92.1	76.8	79.8	82.5	21.3	34.3	20.1	28.0	32.7
Wisconsin	252.5	230.8	256.4	239.9	229.3	68.9	68.8	70.0	69.8	67.3	------	------	------	------	------	4.7	6.2	4.6	6.8	6.8
Wyoming	254.0	207.3	184.9	163.6	160.9	31.5	53.2	55.2	59.7	55.6	73.6	80.7	75.9	74.4	77.4	14.0	11.6	3.9	7.8	6.1
Hawaii	107.1	119.4	100.5	92.8	115.9	64.5	62.2	67.3	61.7	77.0	59.2	64.8	64.2	74.9	103.0	17.0	20.1	18.6	27.2	36.5
Industrial policyholders, Metropolitan Life Insurance Co., ages 1 and over [4]	157.0	161.0	158.1	162.9	161.5	54.6	59.4	60.2	64.9	67.1	------	------	------	------	------	6.6	6.1	5.8	8.1	7.5

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[1] Data not available.

[4] Heart diseases in the data for industrial policyholders excludes pericarditis, acute endocarditis, acute myocarditis, and angina pectoris; nephritis data for industrial policyholders include only chronic nephritis.

TABLE 4.—*Trend of death rates for various causes per 100,000 population*—Continued

RATES PROVISIONAL FOR ALL YEARS

State	All accidents (176–195, 201–214)					Automobile accidents (206, 208, 210)				
	1937	1936	1935	1934	1933	1937	1936	1935	1934	1933
Alabama	72.7	70.2	63.6	61.5	57.7	23.4	24.1	21.0	18.4	18.1
California	(1)	(1)	98.0	95.1	88.9	(1)	(1)	46.0	46.8	39.5
Colorado	94.5	103.1	94.3	89.6	88.3	35.9	36.3	31.2	32.4	30.1
Connecticut	68.4	69.7	72.7	75.5	66.9	24.0	25.7	28.1	28.2	28.0
Delaware	106.5	93.4	96.1	94.1	86.8	42.9	33.6	28.1	34.4	34.4
District of Columbia	82.3	82.0	83.8	93.4	80.7	27.8	33.6	27.8	35.4	26.2
Florida	(1)	102.3	119.2	99.7	88.4	(1)	41.6	39.1	39.3	34.7
Georgia	75.3	90.5	79.3	74.8	66.8	29.6	32.3	30.8	26.8	22.7
Idaho	104.5	111.4	92.1	88.8	80.2	36.7	38.4	34.0	33.0	26.7
Illinois	80.8	99.9	73.5	83.4	72.4	33.1	32.2	29.1	31.8	27.5
Indiana	56.8	105.1	84.5	62.1	85.2	39.3	30.5	35.1	37.0	33.6
Iowa	75.1	87.1	74.9	78.8	70.6	23.9	22.1	24.5	22.7	22.3
Kansas	114.2	95.0	85.9	93.9	82.4	26.9	30.6	31.5	27.9	27.8
Kentucky	71.6	85.8	77.2	78.6	71.3	25.1	23.8	23.7	23.1	19.1
Louisiana	69.4	78.2	73.6	69.4	68.2	22.6	27.2	24.5	23.0	18.9
Maine	74.2	83.5	82.2	83.0	81.1	18.6	24.3	24.8	25.1	24.1
Maryland	92.2	84.9	85.1	83.6	78.7	32.2	27.6	28.0	30.1	30.0
Massachusetts	63.9	69.0	68.7	70.3	64.0	18.9	20.2	19.3	23.4	19.0
Michigan	92.2	99.7	82.7	82.1	71.6	41.0	40.1	35.2	32.5	27.3
Minnesota	75.0	97.8	75.2	74.8	73.8	24.8	26.8	23.7	25.2	22.0
Missouri	79.2	95.4	74.2	98.8	67.8	27.7	25.6	24.7	26.0	21.6
Montana	108.0	121.3	104.0	108.5	95.3	33.2	32.4	30.0	39.0	22.3
Nebraska	66.5	77.9	82.3	79.1	66.9	21.0	22.8	25.6	23.6	22.3
Nevada	157.3	184.0	177.8	180.6	157.2	59.4	74.0	80.8	73.5	65.6
New Jersey	72.1	72.4	69.0	74.1	70.9	26.6	25.8	27.6	28.6	27.8
New York	72.6	71.4	70.7	73.1	70.2	22.6	20.4	22.3	23.4	22.7
North Carolina	72.0	71.4	70.6	69.4	60.3	29.9	28.1	29.4	27.4	23.1
North Dakota	58.9	64.1	55.7	56.6	55.6	19.3	19.2	15.7	18.6	16.9
Ohio	94.6	103.2	91.9	95.1	85.9	36.9	35.8	35.5	34.5	30.2
Oklahoma	61.5	76.2	68.9	65.0	58.7	24.2	25.8	26.5	24.5	20.5
Oregon	89.7	109.6	95.9	88.5	79.4	33.2	35.7	28.8	31.8	26.9
Pennsylvania	66.1	76.6	72.2	75.0	72.0	21.6	24.0	23.4	25.4	23.0
Rhode Island	55.9	58.3	60.4	56.4	55.2	18.1	16.5	15.8	15.1	14.2
South Carolina	87.8	75.2	71.9	70.0	59.7	27.9	31.4	27.7	26.2	19.7
South Dakota	60.3	70.5	63.9	62.1	61.3	15.9	18.5	21.4	17.6	17.2
Tennessee	68.3	77.2	72.5	73.0	65.9	24.5	27.2	25.3	25.0	22.9
Utah	98.4	92.1	91.9	85.4	72.1	38.9	35.9	36.5	37.9	27.1
Vermont	65.5	82.3	92.9	92.7	80.1	17.0	26.3	22.6	26.2	19.4

Virginia	70.8	83.4	82.1	83.5	72.8	28.0	31.2	32.2	29.8	23.8
Washington	99.0	111.4	99.4	98.3	87.7	33.0	38.5	34.6	37.3	28.3
West Virginia	95.1	104.0	99.2	98.2	84.4	24.8	28.0	28.2	23.4	21.8
Wisconsin	83.6	91.2	77.1	75.6	70.8	29.9	26.6	28.6	25.3	23.0
Wyoming	123.9	131.3	124.6	127.7	102.6	53.2	48.9	43.5	47.6	37.8
Hawaii	51.1	(1)	65.0	65.4	55.4	15.0	(1)	18.4	22.7	19.3
Industrial policyholders, Metropolitan Life Insurance Co., ages 1 and over	53.6	57.7	54.5	57.8	55.6	20.9	20.1	20.3	21.1	19.8

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[1] Data not available.

TRENDS IN SHELLFISH SANITATION[1]

By H. N. OLD, *Sanitary Engineer, United States Public Health Service*

By specifying the word "trends" in connection with shellfish sanitation the program committee has conferred upon this public health activity quite an honor. In fact, all of us who are interested in the subject should derive much encouragement. It clearly indicates that the activity is shedding its garments of infancy and donning the raiments of maturity.

While several of the States, notably Rhode Island, New York, and New Jersey, and the Federal Food and Drug authorities did exercise some control over shellfish production and handling prior to 1925, it is quite obvious that the widespread epidemic of typhoid fever which included some 1,500 cases in Washington, Chicago, New York, and several smaller cities in the fall of 1924 brought on what might be termed a New Deal in shellfish sanitation in 1925. Therefore, shellfish sanitation as a major public health engineering activity is only in its thirteenth year. We have progressed rather steadily, but as custodians of this responsibility we find much to be accomplished in the future.

In confining the definition of "shellfish," for the purpose of this paper, to oysters and all varieties of clams there is no intention to discount the problems incident to the production and handling of scallops and the danger of toxic poisoning from mussels at certain times of the year, chiefly on the Pacific coast. However, oysters and clams are of more general concern owing to their comparatively wide distribution and the frequency with which they are consumed uncooked.

The discussion of trends will be taken up under the three major classifications of greatest interest to the public health engineer; namely, (1) Field Survey, (2) Laboratory, and (3) Administration.

FIELD SURVEY

This classification may be broken down further into (1) production areas, (2) wet storage or "floating," and (3) handling, packing, and shipping.

Production areas.—Since 1925 it is quite unlikely that any natural shellfish-growing area in the country has escaped close scrutiny on the part of State or Federal officials or both through sanitary survey and laboratory examination. In fact many areas have been resurveyed several times. This has resulted in the classification of areas (*1*) somewhat as follows:

Approved areas.—Areas so protected against human fecal contamination by distance from source of such pollution, by dilution, and by time afforded for natural purification that chance of dangerous contamination is remote.

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[1] Presented at the Sanitary Engineers and Sanitation Officers Section Meeting, Southern Branch, American Public Health Association, New Orleans, La., November 30, 1937.

Grossly polluted—Restricted areas.—Areas definitely banned for the taking of shellfish, due to gross pollution by reason of sewage discharge directly to the area, continuous exposure to even slight direct contamination with human fecal discharges from nearby sources, or areas, though usually of good quality, which are exposed to occasional direct and immediate contamination with such discharges.

Moderately polluted—Restricted areas.—Areas intermediate between these two with respect to exposure to and protection against fecal pollution. Of course, it is this class that always will require the greatest study of sanitary survey and laboratory findings. Under certain conditions the taking of shellfish from these areas may be permitted if subjected to biological cleansing such as wet storage in chlorinated or safe water or under certain temperature conditions which may afford some relative protection through hibernation.

With respect to bacteriological examination of the overlying water it is the tendency to associate with approved areas laboratory findings of organisms of the *coli-aerogenes* group in 50 percent or less of the 10 cubic centimeter portions, or a score of approximately 0.3. For grossly polluted areas presence of this group in 50 percent or more of the 0.1 cubic centimeter portions, or a score of 32, is deemed consistent, while such finding in 50 percent or more of the 1 cubic centimeter portions, a score of 3.2, would weigh heavily against the moderately polluted areas. However, with less than 50 percent of the 1 cubic centimeter portions positive, approval of the area may be considered.

However, owing to dissatisfaction on the part of most officials relative to the present bacteriological yardstick in use it is quite apparent that, in passing judgment upon a moderately polluted area, the trend, when in doubt, is to place more reliance upon the sanitary survey findings. In this respect, it is quite logical that, with possible illness and death in the balance, any such hair-line decision on the part of a public health official will be against the area. It is seldom that members of the shellfish industry will take issue with this policy.

The problem of pollution has been complicated not only by the increasing contamination of our coastal streams but also by exhaustion of formerly productive natural shellfish areas with consequent need of cultivation of new areas. In this there is a tendency to locate the new areas as close as possible to the labor supply and to shipping facilities. This feature will require vigilance on the part of health authorities.

With respect to the relaying of shell stock from questionable to safe areas, the requirements are being modified to a minimum relaying period of 7 rather than 15 days when the water temperature of the relaying area is above 50° F., but prohibiting relaying entirely when such water temperature is below 50° F., providing further that no removal of shell stock from grossly polluted areas be permitted for relaying during the open market season.

Wet storage ("floating") and cleansing plants.—Considering the unanimity of opinion to the effect that the "floating" or storing of shellfish in water subject either to periodic or constant contamination is the one practice which probably has resulted in doing more injury to the industry than any other single practice because of disease outbreaks (*2*), it is quite logical that more attention and study have been given this feature.

Among reasons for this practice are the balancing of a fluctuating market, availability of product regardless of inclement weather, freshness of product, and elimination of sand and grit from the shells.

Some attempt had been made by the States to restrict this practice, although it was not until the epidemic of 1924 that any vigorous steps were taken. Since that time, despite sanitation of "floating" areas by provision of chemical toilets and other facilities tending to reduce the chances of pollution, it has been the tendency on the part of public health officials to look with much disfavor upon any system requiring enforcement of police regulations to safeguard the sanitary quality of natural areas in which shellfish are frequently stored. The definite trend along this line is indicated by the recommendation of the Committee on Shellfish of the Engineering Section of the American Public Health Association of October 1936, as follows: "It is the consensus of opinion of this Committee that water storage should not be practiced or permitted in any area subject to either direct or intermittent pollution as disclosed by a sanitary survey. Water storage should therefore be practiced only under conditions in which the sanitary quality of the water is under the most rigid control at all times." The latter specification with respect to artificial bodies of water, such as tank treatment for storage or cleansing, infers that the entering water be of bacterial quality at all times at least equal to the United States Treasury Department standards for drinking water (*1*).

It is believed that there will be provided by the industry numerous tank conditioning plants for shellfish by which the product will be stored in suitably designed concrete tanks using water of approximately the same salinity as that of the growing area and of assured safety. Several plants of this kind are being operated very successfully utilizing chlorine for sterilization of the entering water and providing oyster storage of sufficient duration to accomplish the desired conditioning. An experimental plant of this type in Virginia (*3*) has shown excellent results and indicated *coli-aerogenes* reductions of not less than 95 percent in 30 hours at a temperature range between 49° and 53° F. Other plants of similar type are being operated for the conditioning of either oysters or clams, or both, notably those at Newburyport, Mass., (*2*) and West Sayville, Long Island, N. Y. (*2*).

No doubt in the future other moderately polluted areas will be saved by the use of conditioning plants financed and operated by coastal municipalities or groups within the shellfish industry but rigidly supervised by State health authorities.

Handling, packing, and transportation.—While there have been no radical departures in these requirements from the recommendations of the Committee on Sanitary Control of the Shellfish Industry, of February 1925, upon which are based in general the various State regulations as well as the United States Public Health Service Minimum Requirements, there are being adopted several noteworthy revisions.

One of these will prohibit the use of the so-called "Sealshipt" container, a 5-gallon heavy metal can, oval in shape, with a fill-and-empty hole in the middle of the top. The construction of these cans rendered adequate cleansing almost an impossibility.

Another modification in the Federal Minimum Requirements will be the approval of shipping containers of a type described as "nonreturnable, nonreusable shipping containers of waxed paper." A rather satisfactory heavy waxed-paper gallon container has been so devised that the removal and replacement of the top without detection is almost impossible.

It is believed that a tendency exists in some States to modify the requirements relative to compulsory medical examination certificate for each employee. Those of us who have been directly connected with shellfish sanitation supervision have been impressed frequently with the lack of value of the medical certificate usually tacked up in a packing plant or filed away in the operator's desk. No doubt New York City in its three and one-half million laboratory examinations of food handlers in 18 years is in position to pass judgment on this matter and did so 3 years ago in discontinuing the practice.

In this connection, Dr. Knowlton, of the Connecticut State Department of Health (*4*), aptly states that "The problem of food handlers is one to be solved by education rather than by legislative requirements of routine examinations. The essential point is to keep sick people from handling food, and this can be accomplished better by the employer having employees examined when they are ill rather than at regular intervals. General cleanliness and sanitation, and especially thorough washing of the hands, are also essential elements in solving the problem of food handlers."

Of course, all applicants for employment in a shellfish plant should be examined by the employer for open lesions on hands, arms, or face, and questioned relative to evidence of previous typhoid or paratyphoid fever and referred to a laboratory for examination if such evidence is found.

Another commendable trend is that suggested by the New York State Conservation Department's recent adoption of three tag forms, known as "free bay-men's daily lot tag," "shippers' tag," and "split lot tag." These will allow administrative authorities at any point in the chain, by simply observing the tag attached to the shellfish, to learn the source of the product and the various steps through which it has passed up to the point of observation without the necessity of going back through the book records of the various persons or concerns, through whose hands the shellfish may have passed.

Adoption by producing States of a uniform set of tags of this sort will greatly facilitate the tracing and identification of shellfish shipments. In fact, the recent revision of the Public Health Service Minimum Requirements includes this policy.

LABORATORY

Probably the most vital need in shellfish sanitation at present relates to the laboratory features. Much dissatisfaction is voiced among the majority of officials engaged in shellfish sanitation over the present Standard Methods of Shellfish Examination. Some 20 to 25 years ago a very able committee of the American Public Health Association conducted some valuable studies, and reported upon them in 1912 and 1916; and the result, with a few minor changes in phraseology in 1922, is the basis of our present Shellfish Standard Methods. However, in the interim, subsequent studies and practical experience have amply demonstrated the inadequacies of these methods, although most official laboratories are using them simply because they are "standard."

We are, and have been for years, using as index of pollution in judging the safety of oyster areas the so-called *coli-aerogenes* group, whereas many authorities favor the use of a more specific indicator such as *Escherichia coli,* the true colon bacillus. The Eijkman test for this bacillus, however, has been deemed unsatisfactory by some authorities. As there does not seem to be entire agreement upon these points, it is evident that much further research study will be necessary prior to any radical departure from our present indicator.

Another desirable departure upon which there appears to be general agreement is that of using the McCrady table of "most probable numbers" of the indicator adopted per 100 cubic centimeters, rather than the present arbitrary assignment of a score to interpret certain results.

Furthermore, should we continue to examine only oyster shell liquor or use body meat in addition or body meat only? Other questions of this nature are in need of discussion in order to bring up to date the laboratory procedure with respect to shellfish sanitation.

Dr. C. A. Perry, referee of the A. P. H. A. Committee on Bacteriological Methods, submitted questionnaires to 68 interested persons in 1935, and he states (*5*) that "on the basis of questionnaire, conference, and consideration of studies made both in the United States and certain foreign countries, the following principal changes in the present standard procedure for the examination of shellfish are proposed:

"1. The new procedure should include at least such edible mollusks as oysters, clams, and mussels.

"2. *Escherichia coli* rather than the colon group should be the index of pollution for both shellfish and shellfish waters.

"3. A new procedure should include methods for the examination of shellfish waters as well as shellfish.

"4. The whole oyster rather than just the shell liquor should be examined.

"5 *Escherichia coli* results should be expressed as most probable numbers rather than as a score.

"6. Certain recommendations should be made in regard to amount of pollution which should ordinarily be tolerated."

The quotation of these proposals is in no sense an endorsement of them. However, intensive study on the part of those in a position to conduct such research on a representative scale will be of great value. It is understood that some studies of this nature are now under way.

ADMINISTRATION

Legal.—Trends in nearly any activity that concerns commerce or industry are necessarily influenced more or less by legal decisions. Therefore, reference to several court decisions of the last few years may be of interest.

Owing to the pollution of certain tidal flats by domestic sewage from 11 cities and towns in the Merrimack Valley, the construction of a chlorination plant for the treatment or conditioning of clams from these flats was found necessary. In response to an order of the Supreme Court of Massachusetts a commission allocated plant costs by taking the daily water consumption and the figure representing the population of each community contributing to the pollution, dividing each by a figure equivalent to double the distance in miles from the community to the clam areas, and averaging the resulting percentages (*7*). It is assumed that none of these communities had provided sewage treatment; therefore, the amounts and distances were the only controlling factors.

However, in the case of a plaintiff in Connecticut, who owned certain oyster grounds under the tidal waters of Long Island Sound in Norwalk Harbor, a substantial part of which had been acquired since 1925, the State Supreme Court of Errors upheld the trial court in denying relief against the city of Norwalk. In this case sewage had been discharged from Norwalk into the tidal waters for more than 50 years, and the plaintiff, having been in the oyster business in Norwalk for more than 30 years, was entirely familiar with the prevailing method of sewage disposal and its effect upon tidal waters. It was stated by the court "that the acts found were confined to tidal waters and did not constitute a public nuisance; that the plaintiff or his predecessors in title received their grants of oyster grounds subject to the public right of employing tidal waters for drainage purposes, and the exercise thereof by the defendant was not in derogation of any right enjoyed by the plaintiff" (*8*).

Legal backing of the State certification of shellfish plants has been well established in Rhode Island. In proceedings before the supreme court of that State to review the action of the State Commission of Shellfisheries in revoking a certificate of sanitary condition, the petitioner contended the commissioners were without jurisdiction to revoke his certificate on the grounds of "having in his possession quahaugs under legal size, purchasing shellfish from unlicensed fishermen, keeping inaccurate records of the purchase of shellfish, and handling shellfish from areas not approved by the commissioners" inasmuch as there were no findings that his premises were not in a sanitary condition. The general laws, however, provide for the making of "all necessary regulations for enforcing the laws of the State relating to shellfisheries and for executing the duties imposed upon them by law." The applicant had also agreed to "handle, ship, or offer for sale only such shellfish as had been obtained from beds examined, and approved by the Board" as a prerequisite to issuance of a certificate of sanitary condition. The court held this to be a reasonable exercise of the power to make rules and regulations and concluded that "as there was competent evidence tending to prove that the petitioner had violated his agreement, the action of the commissioners in revoking his certificate will not be reviewed" (*9*).

General.—One of the encouraging features with respect to the administrative phase of shellfish sanitation has been the gradual trend toward centering supervision and responsibility in the various State departments of health. Surely the problems are almost wholly of public health nature and it is reasonable to expect that the health departments are best equipped to assume these responsibilities.

In most instances the supervision is being placed under the State health officer, with other departments cooperating, such as the conservation department in connection with the provision of water transportation and patrol of condemned or restricted areas.

Another feature which has been largely instrumental in whatever protection the health authorities have been able to provide the consumers of shellfish since 1925 is the whole-hearted cooperation on the part of the majority of members of the shellfish industry, nearly all of whom are only too glad to aid in maintaining a high standard of sanitation under the guidance of their respective State health departments.

Recent evidence of this spirit is the action of a group of oyster house operators meeting in Florida in September. According to the Florida bulletin (*6*): "Before adjournment, representatives of the oyster industry drew up, for passage by the group, a set of minimum standards which will govern plant operation during the season. These requirements are in accord with State board of health regulations but in addition include items of specific interest and benefit to local plant operators."

In conclusion, it is desired to point out what appears to be the weakest link in the chain of effort on the part of the health authorities of shellfish producing States and the United States Public Health Service to assure a reasonably safe product to the consumers throughout the country Reference is made to the certification policy by which the producing States exercise sanitary supervision over the industry and certify to the Public Health Service the establishments meeting the requirements. The Public Health Service, after assuring itself of the efficacy of State supervision, endorses these certificates and distributes the information at semimonthly intervals throughout the country and to Canada through State and local health authorities.

There is every indication that these lists receive very little attention in most instances on the part of local health authorities—not in all instances, however, as some city and even county health officers are on the alert to exclude from their jurisdictions shellfish not properly identified as to approved origin.

On the whole it is quite evident that interest in shellfish as a safe food product is stronger on the producing than on the receiving or consuming end of the line. If this lack of attention continues in the inland communities it will soon react upon the authorities at the site of production.

Let us hope that the recent increase in State and local health department personnel will stimulate closer supervision over local food markets, restaurants, and hotels dealing in shellfish. Where full-time health units are in operation in cities or counties, there certainly seems to be no excuse for allowing either shucked or shell oysters of unapproved origin to reach the local markets. If the health officer is not receiving the semimonthly list, he should request it by applying to the State health officer or directly to the Surgeon General, and should see that his food division or sanitary officer, during the shellfish season, checks the local supply frequently.

In fact, should an outbreak of gastrointestinal disease occur in his jurisdiction that may be traced to shellfish from an unapproved source, that health officer may be placed in a position of serious official embarrassment.

The development of more rigid control at points of consumption will be a most valuable trend in this public health activity.

SUMMARY

1. Classification of oyster and clam growing areas is discussed from the standpoint of safety.

2. The hazards of "floating" or wet storage are pointed out unless under very rigid control of the water in which shell stock is relayed.

3. The experience thus far and future prospects in the use of shellfish cleansing or conditioning plants are discussed.

4. Certain developments in items of shellfish handling plant sanitation are described, such as shipping containers, identification tags, and medical examination of employees.

5. The trend toward revision of Standard Methods of Shellfish Bacteriological Examination is referred to in some detail, particularly the need of a more specific indicator of fecal pollution and the use of "most probable numbers" rather than score in the interpretation of laboratory findings.

6. Administrative trends are discussed referring to certain legal decisions, concentration of supervision in State health departments, cooperation of the industry, and the need of closer cooperation on the part of health authorities in the so-called consuming States.

REFERENCES

(*1*) United States Public Health Service Minimum Requirements for Approval of State Shellfish Control Measures and Certification for Shippers in Interstate Commerce. Revised October 1937.

(*2*) Report of The Committee on Shellfish. Engineering Section, A. P. H. A. Year Book, 1936–1937, pp. 180–196.

(*3*) Messer and Reece: Progress in Oyster Conditioning. Pub. Health Rep., Vol. 52, No. 42 (October 15, 1937), pp. 1451–1460.

(*4*) Knowlton, Millard: The Problem of Food Handlers. Connecticut Health Bulletin, Vol. 51, No. 10 (October 1937), pp. 233–236.

(*5*) Examination of Shellfish for Fecal Pollution. Committee Report. A. P. H. A. Year Book, 1935–1936, pp. 111–117.

(*6*) Safay, F. A.: Oyster Sanitation. Florida State Notes, October 1937, pp. 153–154.

(*7*) Chlorination of Shellfish Areas Charged to Municipalities. Engineering News-Record, Vol. 115, No. 11 (September 12, 1935), p. 356.

(*8*) Pub. Health Rep., Vol. 46, No. 2 (January 9, 1931), pp. 64–65.

(*9*) Pub. Health Rep., Vol. 49, No. 11 (March 16, 1934), pp. 367–369.

PLANNING THE ORGANIZATION AND CONDUCT OF STREAM POLLUTION SURVEYS[1]

By J. K. Hoskins, *Senior Sanitary Engineer, United States Public Health Service*

Surveys to determine the sanitary condition of polluted streams may be undertaken for any one or a combination of several purposes. The nature of the organization required to conduct such a survey, as well as the survey itself, is, then, very largely dependent upon the kind of information desired. It is therefore highly essential that a clear and complete statement of the objectives be agreed upon first; then the plans for the survey can be built around these requirements. It is not possible to enumerate all of the purposes which stream surveys may be designed to accomplish, but they include the securing of specific information to ascertain:

1. The nature and extent of nuisance conditions resulting from odors, sludge deposits along channels and shore lines, floating sleek, grease and oil and objectionable discolorations, and aquatic growths.
2. Suitability of the stream waters for public or industrial water supply, including the possibilities and probable costs of treatment, chemical and biological characteristics, and adequacy of flow.
3. The capacity of the watercourse for sewage or industrial waste dilution, which is dependent on volume and constancy of flow, extent of the oxygen reserve, degree of sedimentation in the channel, and rates of recovery from pollution.
4. Ability to support fish and other aquatic life as it may be affected by the content of toxic substances, the oxygen balance, and existence of plant and other fish food.
5. Safety for recreational use, which involves the relative freedom from pathogenic bacteria and suspended solids.
6. General relationships of pollutional factors for application to a variety of specific conditions. These relationships include the correlation of known populations and industrial wastes with water quality of the receiving stream, the rates of recovery from determinable pollution under known conditions of depth, velocity, and temperature of the flowing water and the nature and direction of changes in the bacterial, biological, and oxygen content and their interreactions.

The information needed to fulfill these general requirements falls into one of three general classes. The first class deals with the nature, location, and extent of sources of pollution of the stream under investigation, the securing of information on which involves a sanitary survey of the watershed to determine the distribution of the population both sewered and unsewered, the extent of sewage treatment, the location, types and volumes of industrial waste contributions and similar matters. The second general class of information embraces the hydrometric factors, such as the daily volume of flow of the main stream at definite points and of the tributaries at their mouths, the times of flow between different locations, and the records of rainfall and its relation to runoff. The third type of essential data is concerned with the sanitary condition of the water and sediments throughout the channel under varying conditions of stream flow, temperature, and season. The securing of this class of information usually involves laboratory examination of a variety of samples over an extended period of time.

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[1] Presented at the Ohio Conference on Sewage Treatment, Cincinnati, Ohio, October 19-20, 1937.

The relative amount of time to be spent on the assembling of information of these three general types will be governed very largely by the specific objectives of the study. The nature of the organization, in turn, will depend upon the emphasis to be placed on these respective classes of data. It will depend further upon the extent of information readily obtainable from existing governmental agencies, Federal, State, and municipal, which in many cases will be found to have extensive collections of pertinent data. Close contact and cooperation with such agencies is, therefore, highly essential in any stream pollution survey, and time will be well spent in first assembling and correlating this available material. Frequently, also, active cooperation can be obtained from these organizations, particularly when the results can be made of value to them.

ORGANIZATION

Because the complete stream survey requires a wide variety of technical knowledge, the personnel employed will be composed of a number of professional groups, including sanitary engineers, bacteriologists, chemists, and biologists. The amount of service required of each of these groups will depend upon the extent of the particular problem and the thoroughness of the survey. Proper facilities for the collection, review, and filing of collected data are essential for orderly work. Adequate time should be permitted for the critical study of the accumulated material and preparation of a comprehensive report following the conclusion of actual field work. The entire activity will be judged largely by the thoroughness of the finished product—the report, which constitutes the only generally available permanent record.

CONDUCT OF THE POLLUTION SURVEY

It is generally advisable to locate a field headquarters and laboratory close to the stream to be studied and readily accessible to a maximum of stream length. In this way, samples can be examined promptly after collection, hydrometric studies may be carried on to advantage, including the operation and maintenance of stream gages, and special problems of domestic and industrial waste pollution may be investigated during the course of the routine field work. The location should be selected with consideration to the availability of water, gas, and electric current for laboratory use, railway and highway for transportation of needed materials and supplies, and highway connections for prompt delivery of samples from the stream sampling stations.

The sanitary survey.—Determination of the nature and extent of sources of pollution is largely a task of assembling available information from different agencies and filling in the gaps by original investigation. Distribution and density of urban and rural population on any watershed can be computed by employing the published reports of the United States Census Bureau, and a large scale map showing all political subdivisions and drainage areas of the watershed. State governmental agencies, particularly State health departments, usually have extensive data on sewered populations, nature and extent of sewage treatment and types, and sizes and products of industrial establishments, particularly those discharging objectionable liquid wastes. It is sometimes necessary to undertake special surveys of representative industrial plants to gage waste discharges and collect samples for analysis for correlation with raw material, production, or employee statistics. The amount of this work often may be reduced greatly by applying conversion factors thus developed for a representative plant to the wastes of all plants of this particular type of industry on the watershed.

Hydrometric relationships.—The hydrometric study should be conducted in sufficient detail to supply information on the daily volume of stream flow at each sampling station and at each point of significant pollution throughout the period of collection and analysis of samples. The velocity of flow between sampling stations and mouths of principal tributaries throughout the range of gage height fluctuations is also important in connection with the rapidity of travel of pollutional substances down stream. Basic data on stream flow can generally be obtained from the United States Geological Survey; or, if such gagings have not been made, cooperative arrangements can be worked out with that organization for the placing and maintenance of recording or other gages at the proper locations and the establishment of rating stations from which daily stream flows can be computed for the main stream and its principal tributaries. The district engineers of the Geological Survey can give most helpful advice also on methods of computation of stream flows from gage height-rating curve relationships and on the determination of velocities of flow and other essential hydrometric procedures. Velocities of flow may be determined by any of several different methods and the one to be selected will be dependent upon the type of stream under observation and the extent of available knowledge of the stream channel. For large rivers, where accurate information on channel cross sections, stream profiles, and gage height records is available, the displacement method as used in our Ohio River (*1*) and Illinois River (*2*) studies is perhaps the most dependable. For smaller streams, observations of the velocities of travel of floats, dyes, salt solution, or other materials in the water through selected river stretches can be used. Wave-crest travel (*3*) also has been suggested as a method of computing flow velocities, but is not yet in general use. Diurnal variations in the chloride content as contributed by domestic sewage might be used also over considerable stretches of streams where the volume of sewage is large in proportion to the normal stream flow. Organizations concerned with flood control planning and construction, including the United States Army Engineers and State planning and water conservation agencies, are assembling extensive data that may be found most useful for this purpose.

Rainfall and weather records are also helpful in completing the hydrometric studies and for determining the relationship between rainfall and runoff in the different sections of the watershed. Precipitation data are generally obtainable from the United States Weather Bureau, and, where necessary, cooperative arrangements should be considered for increasing the number of rainfall observation stations on the watershed to be surveyed.

These hydrometric data should be collected and arranged with the specific objective of ascertaining the extent of natural dilution that is provided in comparison with the natural purification of contributed pollution that is occurring under varying conditions of stream flow. From the combination of these factors, the reserve capacity of the stream for additional pollution or the extent of pollution overload can be estimated, and, consequently, the determination made of the degree of purification of domestic sewage and industrial wastes that must be provided at each point in order to maintain the stream in the desired sanitary condition.

Sanitary condition of the water.—Determination of the extent of pollution of any body of water usually involves the examination of samples of the contributed polluting constituents and of the water and of bottom sediments of the channel collected throughout a sufficient period of time to take into account seasonal fluctuations in flow, variations in rates of natural purification, and other changing factors. It is generally best to establish definite points for the collection of samples rather than to depend upon random collections from indiscriminate locations. Such stations should be carefully selected with due regard to sources of pollution, mouths of tributaries, accessibility of transport to field laboratories, and representative sections of stream.

In many streams highway and railroad bridges determine the location of sampling stations. In large rivers, boats are frequently necessary to reach the desired points. In moderate or small streams, one sample at mid-depth is usually representative of the cross section. In large rivers, such as the Ohio and Illinois, we collected three samples on a cross section, each at the center of gravity of each third of the wetted cross sectional area. These samples were at first analyzed separately and the results averaged. Later, to reduce the amount of laboratory work, the three samples were composited and the composite analyzed. Comparison of the results by both methods indicated very little variation in the figures obtained. In our study of Lake Michigan (*4*), the water area under investigation was divided up by a grid of intersecting sight lines, and samples were collected at these intersections. Collections of water samples are generally made with the aid of some device that will permit obtaining the sample at any desired depth and in the amounts required for all analytical examinations. Sediment samples can be obtained with a mud scoop or various types of equipment which remove intact a section of deposit from the channel bottom.

The method of transport of samples to the field laboratory will depend on local facilities. In any event, samples should be delivered as quickly as possible after collection, and a maximum elapsed time should be established, not to exceed 6 hours. In warm weather it is desirable to ice all samples either by packing them in ice or in a chilled container. Good highways, when available, greatly facilitate the speedy transportation of samples by the sample collector himself and correspondingly extend the range of service of the field laboratory. In special cases bus or railway express transport service is cheapest, permitting in such instances the use of part-time services of persons in the vicinity of the sampling stations as collectors and shippers.

There are three general types of examination to which polluted water samples may be submitted: bacteriological, biological, and chemical, including biochemical. The laboratory equipment and personnel required for performing these tests will be governed by the number of samples to be examined daily and the tests which each sample will undergo. A good general rule to follow is to examine more frequent samples from a few well-selected sampling stations than a few samples from too large a number of sampling stations. Equipment should be ample but not necessarily elaborate. Much time is saved by an adequate supply of laboratory glassware. Reagents and culture media should be standardized and distributed from the central laboratory to insure uniformity of results. Dehydrated culture media can now be purchased in single lots in quantities sufficient for any reasonable field study. The amounts and nature of equipment and supplies required to operate chemical and bacteriological laboratories of various sizes are given in various laboratory texts. Itemized lists which we have found satisfactory for routine laboratory examination of water and sewage samples have been compiled for our use, copies of which are available on application.

Professional personnel trained in the standardized technique of water examination are essential for the best results. Analytical procedures should conform strictly to the standard methods adopted jointly by the American Public Health and the American Water Works Associations in order that the finished results may be comparable with those of other workers. Any deviations from these accepted methods, however slight, should be described in detail. The range of analytical tests of samples will depend upon the planned thoroughness of the pollution study and its objectives. The minimum of bacteriological tests would include the determination of coliform group organisms and, in special instances, plate counts on agar incubated at 37° C. for 24 hours. The chemical examinations as a minimum should include turbidity, hydrogen ion concentration, dissolved oxygen, and 5-day biochemical oxygen demand. Plankton examinations should distinguish the relative numbers of pollution indicator organisms, both free floating and in bottom sediments, and be made at sufficiently frequent intervals to record the pulses of various indicator forms as they occur during the progress of the seasons. Usually, weekly examinations of water samples and monthly examinations of bottom sediments will meet these requirements.

For more comprehensive studies this laboratory work can be expanded. Thus, in our Scioto River study now in progress, some additional analytical tests are conducted. For the determination of coliform organisms, lactose broth followed by 2 percent brilliant green bile is employed for the confirmed test. In addition, one confirmed sample, rotated daily, is carried to completion through Endo, second lactose broth, second Endo, and agar slant for Gram stain, purity, and spore test. The total bacterial colony count is made for each sample also, using agar plates incubated at 37° C. for 24 hours. The routine chemical tests on each sample include turbidity, hydrogen ion concentration, dissolved oxygen, 5-day biochemical oxygen demand, suspended solids, and alkalinity. To trace further the course of oxidation, one sample, rotated each day, is put up for determination of the 3-, 5-, 7-, 10-, 12-, 15-, 20-, and 25-day oxygen demand.

In addition, samples from selected stations are composited over a period of 1 month, preserved by sulfuric acid, and then shipped to our central laboratory for determination of nitrites, nitrates, ammonia, and organic nitrogen.

The biological examination consists in the determination of the plankton content of water samples collected biweekly, preserved in 6 percent formalin, and shipped to our central laboratory. On alternate weeks similar samples are examined, without the use of preservative, at our Chillicothe field laboratory. Sediment samples are collected once each month, preserved in formalin, and shipped to our headquarters laboratory for determination of pollution indicator organisms.

With the constant accumulation of survey and laboratory data, some attention should be paid to the maintenance and filing of proper current records, summaries, and progress reports. Frequent, careful reviews of the trend of results will indicate the advisability of changes in field methods, relocation, omission or addition of certain sampling stations, recurring errors in sampling or laboratory technique, and various other modifications in procedure that, unless made early in the field study, will greatly detract from the value of the completed work.

The most difficult feature, perhaps, of any stream pollution survey is the critical weighing of all the evidence, the derivation of conclusions based on this evidence, and the presentation of this material in concise, understandable form. Too much time and concentration cannot be devoted to this part of the survey when it is remembered that the finished report will be the only permanent record generally available. Every effort should be made, therefore, to derive from the carefully summarized data all the pertinent facts which they contain, to point them out in their logical sequence, and to draw from them unbiased, logical conclusions that are well substantiated. Usually it will be advisable to limit the tabulated material to monthly or periodic averages rather than to publish tables of detailed analytical results. Diagrams illustrative of outstanding trends are most helpful in reinforcing the text. Photographs have a place in reports prepared for the general reader. Pollution surveys thus reported are of more than local value; they add to our general knowledge of the resultant effects of pollution discharged to streams and of the essential correctional measures necessary for stream improvement.

REFERENCES

(*1*) A study of the pollution and natural purification of the Ohio River. II. Report on surveys and laboratory studies. Pub. Health Bull. No. 143 (July 1924).

(*2*) A study of the pollution and natural purification of the Illinois River. I. Surveys and laboratory studies. Pub. Health Bull. No. 171 (May 1927).

(*3*) The hydraulics of flood movements in rivers. By Harold A. Thomas. Engineering Bulletin of the Carnegie Institute of Technology, Pittsburgh, Pa. 1937.

(*4*) Report of investigation of the pollution of Lake Michigan in the vicinity of South Chicago and the Calumet and Indiana harbors, 1924–25. By H. R. Crohurst and M. V. Veldee. Pub. Health Bull. No. 170 (February 1927).

CARE DURING THE RECOVERY PERIOD IN PARALYTIC POLIOMYELITIS

The United States Public Health Service has recently issued a report[1] containing a detailed presentation of the after care of convalescent poliomyelitis patients as given at the Children's Hospital School in Baltimore, Md. This monograph has been written primarily to stress the importance of careful handling of the weak or paralyzed muscles in order to prevent deformities and obtain the maximum recovery of muscle strength.

The introduction by Drs. Bennett and Johnson discusses briefly some pathological changes in poliomyelitis. Part I presents the principles of rest, protection, and stimulative treatment. Part II explains the principles involved in detailed muscle examinations. In part III, all muscles of extremities, head, and upper trunk are charted according to (*a*) muscle group and isolated muscles, (*b*) position for testing, (*c*) test movement. Part IV is a detailed description of the position, actions, and test movements of the abdominal muscles. Part V is a description of the protection used for weakness of muscle groups or individual muscles, and is charted according to (*a*) weak muscle or muscle groups, (*b*) protection position, and (*c*) type of protective support. Part VI describes the actions in the upright position of some of the important muscles, and explains how the function in weight bearing differs from the action in the lying position.

The Bulletin is well illustrated with drawings and photographs showing the examination and testing of muscles, muscle protection and training, and correctional braces.

DEATHS DURING WEEK ENDED APRIL 16, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Apr. 16, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	8,646	9,122
Average for 3 prior years	9,038	
Total deaths, first 15 weeks of year	132,973	151,357
Deaths under 1 year of age	517	594
Average for 3 prior years	594	
Deaths under 1 year of age, first 15 weeks of year	8,100	9,371
Data from industrial insurance companies:		
Policies in force	69,653,205	69,693,853
Number of death claims	12,072	14,545
Death claims per 1,000 policies in force, annual rate	9.0	10.9
Death claims per 1,000 policies, first 15 weeks of year, annual rate	10.0	11.5

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[1] Public Health Bulletin No. 242. By Henry O. Kendall and Florence P. Kendall, Children's Hospital School, Baltimore, Md , with an introduction by George E. Bennett and Robert W. Johnson, Jr., Johns Hopkins University School of Medicine, Baltimore, Md. U. S. Govt. Printing Office, Washington, D. C. Price 20 cents.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (------) indicate that cases or deaths may have occurred although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Apr. 23, 1938, and Apr. 24, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Apr. 23, 1938	Week ended Apr. 24, 1937	Week ended Apr. 23, 1938	Week ended Apr. 24, 1937	Week ended Apr. 23, 1938	Week ended Apr. 24, 1937	Week ended Apr. 23, 1938	Week ended Apr. 24, 1937
New England States:								
Maine	3	2	4	1	222	21	0	0
New Hampshire	0	0	-------	-------	37	26	0	0
Vermont	0	0	-------	-------	141	1	0	0
Massachusetts	5	2	-------	-------	344	621	1	5
Rhode Island	0	0	-------	-------	2	194	1	1
Connecticut	6	4	5	4	38	632	1	3
Middle Atlantic States:								
New York	31	62	[1] 9	[1] 10	4,095	1,152	5	8
New Jersey	11	17	4	7	1,834	2,082	0	2
Pennsylvania	45	38	-------	-------	5,507	1,112	8	8
East North Central States:								
Ohio	11	6	-------	23	2,013	1,041	2	1
Indiana	15	5	8	13	1,306	400	1	1
Illinois	37	35	6	64	2,906	188	0	5
Michigan [2]	13	20	2	1	4,588	138	3	8
Wisconsin	0	4	17	52	2,730	34	0	2
West North Central States:								
Minnesota	4	1	2	-------	292	23	1	1
Iowa	2	4	1	51	228	12	1	0
Missouri	7	21	45	92	386	56	1	6
North Dakota	1	4	3	27	240	2	1	1
South Dakota	1	0	-------	-------	-------	-------	0	0
Nebraska	1	1	-------	-------	154	18	1	4
Kansas	3	2	7	4	770	47	0	0
South Atlantic States:								
Delaware	1	1	-------	-------	40	67	0	1
Maryland [2]	1	14	6	11	101	606	1	4
District of Columbia	4	2	-------	1	23	107	2	2
Virginia	9	9	-------	-------	457	617	2	7
West Virginia	3	7	22	33	371	108	7	4
North Carolina [3]	15	12	8	30	2,412	133	2	13
South Carolina [3]	4	5	154	388	243	64	0	1
Georgia [3]	4	3	-------	131	597	-------	0	1
Florida	5	1	2	-------	368	-------	0	14

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Apr. 23, 1938, and Apr. 24, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Apr. 23, 1938	Week ended Apr. 24, 1937	Week ended Apr. 23, 1938	Week ended Apr. 24, 1937	Week ended Apr. 23, 1938	Week ended Apr. 24, 1937	Week ended Apr. 23, 1938	Week ended Apr. 24, 1937
East South Central States:								
Kentucky	6	2	9	15	403	373	4	28
Tennessee	2	10	25	48	260	36	5	4
Alabama [3]	3	9	45	151	600	35	6	18
Mississippi [2]	2	5					1	0
West South Central States:								
Arkansas	12	1	44	107	322	1	0	1
Louisiana [3]	9	15	6	18	15	8	3	5
Oklahoma [4]	4	12	41	108	123	77	0	1
Texas [3]	29	46	233	504	208	811	0	4
Mountain States:								
Montana	0	0		6	23	19	0	1
Idaho	0	0	3	10	14	71	0	0
Wyoming [5]	0	0			58	11	0	0
Colorado	13	7			352	6	3	1
New Mexico	1	5	1	2	70	134	0	1
Arizona	1	3	51	29	29	165	0	0
Utah [2]	0	0			265	24	1	0
Pacific States:								
Washington	5	0			7	52	0	0
Oregon [5]	2	0	28	18	62	10	0	2
California	24	50	15	98	685	293	0	5
Total	355	447	806	2,117	35,941	11,630	64	169
First 16 weeks of year	8,902	8,084	38,103	264,910	523,973	115,783	1,359	2,708

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended Apr. 23, 1938	Week ended Apr. 24, 1937	Week ended Apr. 23, 1938	Week ended Apr. 24, 1937	Week ended Apr. 23, 1938	Week ended Apr. 24, 1937	Week ended Apr. 23, 1938	Week ended Apr. 24, 1937	Week ended Apr. 23, 1938
New England States:									
Maine	0	0	35	26	0	0	0	1	33
New Hampshire	0	0	7	6	0	0	0	0	
Vermont	0	0	6	9	0	0	0	0	25
Massachusetts	0	0	369	245	0	0	1	9	95
Rhode Island	0	0	17	46	0	0	0	1	
Connecticut	0	0	119	163	0	0	1	0	57
Middle Atlantic States:									
New York	0	0	822	1,026	0	0	1	5	389
New Jersey	2	0	149	205	0	0	5	4	202
Pennsylvania	2	0	692	589	0	0	11	7	256
East North Central States:									
Ohio	2	0	214	229	7	0	6	6	109
Indiana	0	0	88	160	67	19	9	1	30
Illinois	2	0	458	814	20	55	3	3	136
Michigan [3]	0	0	455	816	6	1	2	2	312
Wisconsin	0	1	167	305	9	4	1	2	174
West North Central States:									
Minnesota	0	0	102	158	14	22	0	0	16
Iowa	0	1	179	271	47	34	0	2	19
Missouri	0	0	86	405	27	74	2	3	18
North Dakota	0	0	30	32	5	58	1	1	18
South Dakota	0	0	13	59	17	7	0	0	6
Nebraska	0	1	21	195	9	12	0	0	11
Kansas	1	0	111	289	24	20	4	0	118
South Atlantic States:									
Delaware	0	0	16	6	0	0	0	0	11
Maryland [2]	0	0	69	58	0	0	1	4	48
District of Columbia	0	0	27	18	0	0	0	1	13
Virginia	0	0	31	8	0	0	2	1	61
West Virginia	1	2	36	50	0	1	0	1	86
North Carolina [3]	1	0	24	41	0	1	1	2	855
South Carolina [3]	0	0	3	1	0	0	0	1	65
Georgia [3]	1	0	2	6	0	0	7	8	92
Florida	0	0	5	42	0	0	[illegible]	[illegible]	[illegible]

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Apr. 23, 1938, and

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended Apr. 23, 1938	Week ended Apr. 24, 1937	Week ended Apr. 23, 1938	Week ended Apr. 24, 1937	Week ended Apr. 23, 1938	Week ended Apr. 24, 1937	Week ended Apr. 23, 1938	Week ended Apr. 24, 1937	Week ended Apr. 23, 1938
East South Central States:									
Kentucky	2	0	51	60	16	0	3	4	52
Tennessee	0	0	22	30	0	0	0	1	41
Alabama [3]	0	0	5	10	0	1	0	0	33
Mississippi [2]	1	3	3	1	1	0	3	0	--------
West South Central States:									
Arkansas	0	0	5	13	6	5	6	3	35
Louisiana [3]	0	0	9	13	0	0	16	6	34
Oklahoma [4]	1	0	23	41	3	3	0	11	51
Texas [3]	2	2	183	123	8	7	15	7	244
Mountain States:									
Montana	0	0	12	25	4	14	0	2	26
Idaho	0	0	6	27	12	3	1	0	5
Wyoming [5]	0	0	3	5	0	2	0	0	10
Colorado	1	0	47	40	4	9	1	1	46
New Mexico	0	1	11	44	0	0	2	3	42
Arizona	0	2	7	19	15	0	1	0	46
Utah [2]	0	0	60	22	2	0	0	0	82
Pacific States:									
Washington	0	1	35	26	32	14	0	1	167
Oregon [5]	0	0	53	30	10	19	0	0	28
California	0	2	154	202	52	14	9	6	619
Total	19	16	5,042	7,018	417	399	118	107	4,341
First 16 weeks of year	326	339	95,816	110,251	8,588	5,097	1,895	1,751	66,701

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[1] New York City only.

[2] Period ended earlier than Saturday.

[3] Typhus fever, week ended Apr. 23, 1938, 12 cases as follows: North Carolina, 1; South Carolina, 1; Georgia 6; Alabama, 2; Louisiana, 1; Texas, 1.

[4] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

[5] Rocky Mountain spotted fever, week ended Apr. 23, 1938, 3 cases as follows: Wyoming, 2; Oregon, 1.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
March 1938										
California	19	173	324	10	2,845	19	11	1,190	197	22
Florida	4	47	9	17	3,460	5	0	23	1	8
Georgia	8	40	327	100	1,827	61	4	34	16	14
Illinois	10	154	62	7	28,201	1	7	2,834	181	23
Louisiana	9	43	54	37	57	10	2	58	7	108
Maryland	4	32	58	2	352	1	0	377	0	5
Mississippi	4	28	4,893	1,458	1,964	284	3	25	1	8
Montana	1	5	227	--------	177	--------	0	101	38	2
Nebraska	24	23	64	--------	166	--------	0	202	28	0
Nevada	0	3	16	--------	42	--------	0	9	0	3
New York	34	148	--------	7	10,619	--------	8	4,479	0	18
North Dakota	2	5	79	--------	113	--------	1	111	46	0
Oklahoma	3	30	489	20	321	15	2	92	53	7
Oregon	0	3	234	--------	106	--------	1	207	121	4
Pennsylvania	20	206	--------	1	31,994	1	3	2,844	0	27
Rhode Island	3	2	5	--------	19	--------	0	136	0	1
South Carolina	--------	139	1,375	274	1,879	67	0	12	0	1
South Dakota	1	2	31	--------	17	--------	0	69	62	0
Tennessee	19	33	320	11	2,903	28	1	151	38	11
Texas	12	173	2,635	33	1,449	146	6	487	94	47
Washington	3	11	62	--------	47	--------	2	228	215	7

Summary of monthly reports from States—Continued

March 1938

	Cases
Actinomycosis:	
Illinois	2
Anthrax:	
Pennsylvania	1
South Dakota	1
Botulism:	
Washington	7
Chickenpox:	
California	5,320
Florida	310
Georgia	279
Illinois	2,294
Louisiana	117
Maryland	858
Mississippi	742
Montana	391
Nebraska	240
Nevada	2
New York	4,487
North Dakota	181
Oklahoma	103
Oregon	423
Pennsylvania	5,059
Rhode Island	110
South Carolina	186
South Dakota	141
Tennessee	169
Texas	1,000
Washington	862
Conjunctivitis:	
Georgia (acute infectious)	4
Washington	1
Dengue:	
Mississippi	2
South Carolina	2
Texas	8
Diarrhea:	
Maryland	3
South Carolina	219
Dysentery:	
California (amoebic)	8
California (bacillary)	32
Florida	2
Georgia (amoebic)	11
Georgia (bacillary)	3
Illinois (amoebic)	6
Illinois (amoebic carriers)	23
Illinois (bacillary)	5
Louisiana (amoebic)	4
Maryland (bacillary)	6
Mississippi (amoebic)	84
Mississippi (bacillary)	232
New York (amoebic)	18
New York (bacillary)	51
Oklahoma	2
Pennsylvania (amoebic)	2
Tennessee (amoebic)	1
Tennessee (bacillary)	4
Texas (amoebic)	1
Texas (bacillary)	30
Washington (amoebic)	1
Encephalitis, epidemic or lethargic:	
California	5
Florida	1
Illinois	6
Louisiana	1
Maryland	1
New York	15
Pennsylvania	4
Tennessee	1
Texas	3
Food poisoning:	
California	40
German measles:	
California	174
Florida	1
Illinois	211
Maryland	26
German measles—Con.	
Montana	4
New York	259
North Dakota	2
Pennsylvania	316
Rhode Island	17
Tennessee	1
Washington	10
Granuloma, coccidioidal:	
California	9
Hookworm disease:	
California	1
Florida	1,185
Georgia	2,056
Louisiana	28
South Carolina	97
Tennessee	1
Impetigo contagiosa:	
Illinois	12
Maryland	9
Montana	6
Oregon	109
Tennessee	1
Washington	3
Jaundice:	
California (epidemic)	38
Maryland	1
Leprosy:	
Louisiana	1
Mumps:	
California	2,965
Florida	83
Georgia	250
Illinois	1,132
Louisiana	6
Maryland	199
Mississippi	360
Montana	196
Nebraska	165
Nevada	136
North Dakota	54
Oklahoma	13
Oregon	96
Pennsylvania	6,417
Rhode Island	54
South Carolina	103
South Dakota	80
Tennessee	314
Texas	360
Washington	1,011
Ophthalmia neonatorum:	
Florida	3
Illinois	3
New York [1]	8
Pennsylvania	5
South Carolina	3
South Dakota	4
Tennessee	3
Paratyphoid fever:	
California	5
Georgia	4
Louisiana	5
New York	8
Tennessee	1
Texas	3
Puerperal septicemia:	
Georgia	5
Mississippi	23
Tennessee	7
Rabies in animals:	
California	209
Florida	2
Illinois	43
Louisiana	26
Maryland	1
Mississippi	26
New York [1]	12
Oregon	3
Rhode Island	4
South Carolina	43
Washington	30
Rabies in man:	
California	2
Rocky Mountain spotted fever:	
Oregon	1
Tennessee	1
Scabies:	
Maryland	3
Montana	5
Oklahoma	8
Oregon	126
Washington	5
Septic sore throat:	
California	15
Florida	1
Georgia	32
Illinois	6
Louisiana	16
Maryland	35
Montana	9
Nebraska	1
New York	226
Oklahoma	67
Oregon	24
Rhode Island	40
South Dakota	13
Tennessee	22
Washington	10
Tetanus:	
California	9
Florida	2
Illinois	2
Louisiana	4
Maryland	1
New York	2
Tennessee	2
Trachoma:	
California	46
Illinois	39
Montana	29
Oklahoma	3
South Dakota	1
Tennessee	2
Trichinosis:	
California	15
Illinois	2
Maryland	1
New York	26
Tularaemia:	
California	2
Georgia	11
Illinois	2
Louisiana	15
Montana	1
New York	1
Oklahoma	4
Pennsylvania	1
Tennessee	1
Texas	6
Typhus fever:	
Florida	4
Georgia	27
Louisiana	1
New York	1
South Carolina	1
Tennessee	1
Texas	20
Undulant fever:	
California	19
Florida	3
Georgia	6
Illinois	10
Louisiana	8
Maryland	4
Mississippi	1
New York	25
Oklahoma	122
Pennsylvania	12
Rhode Island	4
South Carolina	1
Tennessee	1
Texas	14
Washington	4

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[1] Exclusive of New York City.

Summary of monthly reports from States—Continued

March 1938 -Continued

Vincent's infection:	
Florida.	
Illinois	21
Maryland	11
Montana	1
New York [1]	100
North Dakota	1
Oregon	10
Tennessee	1
Washington	5

[1] Exclusive of New York City.

Whooping cough:	Cases
California	2,562
Florida	30
Georgia	200
Illinois	491
Louisiana	97
Maryland	301
Mississippi	955
Montana	162
Nebraska	43
Nevada	10
New York	1,976

Whooping cough—Con.	Cases
North Dakota	97
Oklahoma	158
Oregon	80
Pennsylvania	1,276
Rhode Island	162
South Carolina	310
South Dakota	99
Tennessee	221
Texas	1,290
Washington	714

WEEKLY REPORTS FROM CITIES

City reports for week ended Apr. 16, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	184	256	83	7,304	815	2,530	26	423	26	1,415	------
Current week [1]	117	104	32	10,616	615	1,948	23	395	21	1,118	------
Maine:											
Portland	0	------	0	13	2	4	0	0	1	15	19
New Hampshire:											
Concord	0	------	0	0	3	1	0	0	0	1	10
Manchester	0	------	0	0	1	4	0	1	0	0	23
Nashua	0	------	0	0	0	0	0	0	0	0	7
Vermont:											
Barre	0	------	------	0	------	0	0	------	0	0	------
Burlington	0	------	0	8	0	0	0	0	0	1	8
Rutland	0	------	0	0	1	0	0	0	0	0	6
Massachusetts:											
Boston	1	------	1	232	22	113	0	9	0	20	234
Fall River	0	------	1	1	1	0	0	0	0	0	29
Springfield	0	------	0	16	1	1	0	1	0	8	37
Worcester	0	------	0	0	8	17	0	2	0	5	57
Rhode Island:											
Pawtucket	0	------	0	0	0	2	0	0	0	0	19
Providence	0	1	0	0	11	11	0	0	0	15	84
Connecticut:											
Bridgeport	0	------	0	0	3	23	0	1	0	0	29
Hartford	0	------	0	4	3	25	0	1	0	0	26
New Haven	0	------	0	0	0	2	0	0	0	2	43
New York:											
Buffalo	0	------	1	2	19	90	0	8	0	18	147
New York	31	5	3	2,281	127	466	0	84	1	202	1,585
Rochester	1	1	0	6	4	16	0	0	1	6	76
Syracuse	0	------	0	31	4	8	0	0	0	8	65
New Jersey:											
Camden	1	------	0	43	1	1	0	1	0	1	23
Newark	0	------	0	16	12	7	0	2	0	31	74
Trenton	0	------	0	0	4	2	0	3	0	1	27
Pennsylvania:											
Philadelphia	3	9	2	1,084	24	136	0	22	2	43	488
Pittsburgh	1	2	2	117	19	53	0	4	0	21	157
Reading	0	------	0	20	2	2	0	0	0	2	39
Scranton	0	------	------	27	------	7	0	------	0	0	------
Ohio:											
Cincinnati	4	------	0	9	6	12	0	11	0	4	144
Cleveland	0	16	3	332	14	55	0	10	0	26	197
Columbus	3	2	2	60	3	8	2	3	0	2	82
Toledo	0	1	1	113	3	4	0	10	0	12	58
Indiana:											
Anderson	0	------	0	150	3	2	0	0	0	0	16
Fort Wayne	1	------	0	40	7	3	0	1	0	0	26
Indianapolis	0	------	1	171	9	20	2	7	0	0	115
South Bend	0	------	0	42	1	10	0	0	0	0	17
Terre Haute	1	------	0	12	0	4	0	0	0	0	15

[1] Figures for Fargo estimated; report not received.

City reports for week ended Apr. 16, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Illinois:											
Alton	0	------	0	1	2	3	0	0	0	0	9
Chicago	10	3	1	1,373	38	261	0	50	1	51	728
Elgin	0	------	0	0	1	4	0	0	0	1	11
Moline	0	------	0	16	0	3	0	0	0	0	5
Springfield	0	------	0	112	2	2	0	0	0	0	18
Michigan:											
Detroit	9	2	0	1,593	19	162	0	18	1	93	277
Flint	0	------	0	142	2	55	0	0	0	20	22
Grand Rapids	0	------	0	159	2	6	0	1	0	4	32
Wisconsin:											
Kenosha	0	------	0	98	2	0	0	0	0	0	13
Madison	0	------	0	75	0	2	0	0	0	7	8
Milwaukee	1	------	0	354	7	12	0	5	0	71	125
Racine	0	------	0	388	0	6	0	0	0	13	13
Superior	0	------	0	6	0	1	0	0	0	0	4
Minnesota:											
Duluth	0	------	0	5	5	1	0	1	0	10	21
Minneapolis	0	------	0	49	6	25	1	0	0	0	105
St. Paul	1	------	0	4	5	5	0	0	0	1	53
Iowa:											
Cedar Rapids	0	------	--------	1	-------	5	0	-------	0	3	--------
Davenport	0	------	--------	1	-------	2	0	-------	0	0	--------
Des Moines	0	------	0	22	0	27	3	0	0	0	4
Sioux City	0	------	--------	0	-------	10	0	-------	0	1	--------
Waterloo	0	------	--------	111	-------	8	1	-------	0	0	--------
Missouri:											
Kansas City	0	1	0	61	12	18	0	2	0	5	85
St. Joseph	0	------	0	41	5	1	0	0	0	0	31
St. Louis	5	------	0	3	6	77	0	4	0	0	221
North Dakota:											
Fargo	0	------	0	1	2	0	0	1	0	0	7
Grand Forks	0	------	--------	83	-------	0	0	-------	0	0	--------
Minot	0	------	0	0	0	0	3	0	0	1	7
South Dakota:											
Aberdeen	0	------	--------	0	-------	2	0	-------	0	1	--------
Sioux Falls	0	------	0	0	0	0	0	0	0	0	12
Nebraska: Omaha	0	------	1	80	9	2	0	3	0	1	51
Kansas:											
Lawrence	0	1	1	4	0	0	0	0	0	0	3
Topeka	0	------	0	141	0	4	0	0	0	28	11
Wichita	1	------	0	15	3	3	1	0	0	0	27
Delaware:											
Wilmington	2	------	0	16	2	0	0	1	0	2	25
Maryland:											
Baltimore	2	4	1	8	27	40	0	9	0	34	252
Cumberland	0	------	0	3	2	2	0	0	0	0	14
Frederick	1	------	0	2	0	2	0	0	0	0	2
District of Columbia:											
Washington	2	2	1	19	10	26	0	16	2	7	107
Virginia:											
Lynchburg	0	------	0	2	0	0	0	1	0	1	7
Norfolk	0	1	0	31	4	4	0	1	0	4	25
Richmond	0	------	1	125	8	4	0	1	0	0	48
Roanoke	0	------	0	0	1	1	0	1	0	2	19
West Virginia:											
Charleston	1	------	0	6	3	0	0	2	0	0	35
Wheeling	0	------	0	109	1	3	0	3	0	7	22
North Carolina:											
Gastonia	1	------	--------	47	-------	0	0	-------	0	12	--------
Raleigh	0	------	0	67	3	0	0	1	0	2	15
Wilmington	0	------	0	100	0	0	0	0	0	16	6
Winston-Salem	0	------	0	18	0	1	0	1	0	25	10
South Carolina:											
Charleston	0	18	1	7	1	1	0	3	0	0	24
Florence	0	------	0	25	0	0	0	0	0	0	16
Greenville	0	------	0	1	0	0	0	0	0	4	9
Georgia:											
Atlanta	0	7	0	20	8	1	0	2	0	7	85
Brunswick	1	------	0	1	0	0	0	0	0	0	2
Savannah	0	------	0	51	1	0	0	3	0	2	28
Florida:											
Miami	1	1	1	29	0	0	0	2	2	1	24
Tampa	1	1	1	33	2	0	0	1	0	0	31
Kentucky:											
Ashland	0	3	--------	0	-------	1	0	-------	0	3	--------
Covington	6	------	0	0	1	1	0	1	0	0	23
Lexington	1	------	0	2	2	1	0	2	0	2	20
Louisville	5	2	0	232	6	21	0	0	0	1	58

City reports for week ended Apr. 16, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Tennessee:											
Knoxville	3	------	0	33	1	1	0	0	0	1	18
Memphis	0	------	2	35	6	0	0	7	1	1	98
Nashville	0	------	1	44	2	6	0	3	2	6	47
Alabama:											
Birmingham	2	10	1	41	3	5	0	4	0	0	73
Mobile	0	------	0	9	2	0	0	2	0	0	23
Montgomery	1	------	--------	145	-------	0	0	-------	0	2	--------
Arkansas:											
Fort Smith	0	------	--------	0	-------	1	0	-------	0	2	--------
Little Rock	0	------	0	4	1	2	0	0	0	4	--------
Louisiana:											
Lake Charles	0	------	0	2	0	0	0	0	0	0	1
New Orleans	2	5	0	4	12	0	5	13	4	9	122
Shreveport	0	------	0	7	4	2	0	2	0	0	46
Oklahoma:											
Muskogee	0	------	--------	0	-------	1	0	-------	0	0	--------
Oklahoma City	1	------	0	0	2	2	0	3	0	0	43
Tulsa	0	------	--------	98	-------	1	5	-------	0	2	--------
Texas:											
Dallas	2	1	1	6	2	3	0	3	0	1	61
Fort Worth	0	------	0	1	3	2	0	3	0	7	40
Galveston	1	------	0	0	3	1	0	1	0	0	13
Houston	4	------	0	2	9	5	3	6	3	0	91
San Antonio	0	------	1	1	5	1	0	13	0	0	84
Montana:											
Billings	0	------	0	0	2	0	0	0	0	6	10
Great Falls	0	------	0	0	3	1	1	0	0	8	11
Helena	0	------	0	0	0	0	0	0	0	1	1
Missoula	0	------	0	0	2	0	0	0	0	0	6
Idaho:											
Boise	1	------	0	0	1	1	4	0	0	0	9
Colorado:											
Colorado Springs	0	------	0	0	0	1	0	3	0	5	16
Denver	3	------	1	160	5	15	0	5	0	13	74
Pueblo	1	------	0	1	0	1	0	1	0	27	10
New Mexico:											
Albuquerque	0	------	0	2	0	0	0	0	0	1	8
Utah:											
Salt Lake City	1	------	0	240	3	12	0	1	0	1	32
Washington:											
Seattle	1	------	1	2	10	6	0	0	0	29	104
Spokane	0	1	1	0	4	2	1	0	0	23	20
Tacoma	0	------	0	0	2	9	0	1	0	13	38
Oregon:											
Portland	2	------	1	15	5	15	0	0	0	0	77
Salem	0	2	--------	0	-------	0	0	-------	0	0	--------
California:											
Los Angeles	13	13	0	31	17	40	2	16	0	38	317
Sacramento	1	------	0	9	4	5	0	0	1	41	34
San Francisco	0	------	0	2	8	7	0	17	0	53	167

State and city	Meningococcus meningitis		Poliomyelitis cases	State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
New York:				Iowa:			
Buffalo	6	2	0	Des Moines	2	0	0
New York	2	0	0	Maryland:			
Pennsylvania:				Baltimore	1	0	0
Pittsburgh	1	0	0	District of Columbia:			
Ohio:				Washington	1	0	0
Cincinnati	1	0	0	Tennessee:			
Illinois:				Knoxville	0	0	1
Chicago	1	0	0	Alabama:			
Michigan:				Birmingham	2	0	1
Detroit	1	0	0	Colorado:			
				Pueblo	1	0	0

Encephalitis, epidemic or lethargic.—Cases: New York, 1; Philadelphia, 1; Chicago, 1; Detroit, 1; Salem, Oreg., 1; San Francisco, 1.

Pellagra.—Cases: Washington, 1; Atlanta, 1; Savannah, 2; Miami, 1; Louisville, 1; Birmingham, 1; San Francisco, 1.

FOREIGN AND INSULAR

GREAT BRITAIN

England and Wales—Infectious diseases—13 weeks ended January 1, 1938.—During the 13 weeks ended January 1, 1938, certain infectious diseases were reported in England and Wales as follows:

Disease	Cases	Disease	Cases
Diphtheria	20,854	Puerperal pyrexia	[1] 2,200
Dysentery	3,000	Scarlet fever	32,869
Ophthalmia neonatorum	1,160	Smallpox	1
Pneumonia	12,383	Typhoid fever	605

[1] Includes puerperal fever.

England and Wales—Vital statistics—Fourth quarter 1937.—During the quarter ended December 31, 1937, 142,846 live births and 127,041 deaths were registered in England and Wales. The following statistics are taken from the Quarterly Return of Births, Deaths, and Marriages, issued by the Registrar General of England and Wales, and are provisional:

Birth and death rates in England and Wales, quarter ended Dec. 31, 1937

Annual rates per 1,000 population:		Annual rates per 1,000 population—Contd.	
Live births	13.8	Deaths from—Continued.	
Stillbirths	.57	Influenza	0.11
Deaths, all causes	12.3	Measles	.03
Deaths under 1 year of age	[1] 61	Scarlet fever	.01
Deaths from:		Typhoid and paratyphoid fevers	.01
Diarrhea and enteritis (under 2 years of age)	[1] 7.0	Violence	.53
Diphtheria	.08	Whooping cough	.02

[1] Per 1,000 live births.

ITALY

Communicable diseases—4 weeks ended February 27, 1938.—During the 4 weeks ended February 27, 1938, cases of certain communicable diseases were reported in Italy as follows:

Disease	Jan. 31-Feb. 6	Feb. 7-13	Feb. 14-20	Feb. 21-27
Anthrax	17	14	9	9
Cerebrospinal meningitis	41	36	39	35
Chickenpox	393	409	395	432
Diphtheria	719	697	653	643
Dysentery	27	18	22	14
Hookworm disease	12	7	9	9
Lethargic encephalitis	4	3	3	1
Measles	2,706	2,980	3,074	3,556
Mumps	363	327	307	335
Paratyphoid fever	27	47	53	44
Pellagra	1	1	1	4
Poliomyelitis	18	19	24	12
Puerperal fever	54	37	58	42
Scarlet fever	259	280	319	296
Typhoid fever	296	261	221	183
Undulant fever	74	93	96	97
Whooping cough	380	361	299	356

JAMAICA

Communicable diseases—4 weeks ended April 16, 1938.—During the 4 weeks ended April 16, 1938, cases of certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis	1	2	Leprosy	1	3
Chickenpox	13	69	Puerperal fever		6
Diphtheria	2		Scarlet fever		1
Dysentery	22	8	Tuberculosis	40	86
Erysipelas		2	Typhoid fever	4	24

YUGOSLAVIA

Communicable diseases—4 weeks ended March 27, 1938.—During the 4 weeks ended March 27, 1938, certain communicable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	15		Paratyphoid fever	13	
Cerebrospinal meningitis	117	37	Scarlet fever	244	3
Diphtheria and croup	640	50	Sepsis	13	5
Dysentery	18	1	Tetanus	15	8
Erysipelas	198	3	Typhoid fever	254	24
Favus	10		Typhus fever	106	5
Lethargic encephalitis	1	1	Weil's disease	1	

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for April 29, 1938, pages 685-700. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

Indochina (French).—During the week ended April 16, 1938, cholera was reported in French Indochina as follows: Annam Province, 65 cases; Tonkin Province, 121 cases; Hanoi, 13 cases.

Plague

Hawaii Territory—Island of Hawaii—Hamakua District—Paauhau Sector.—A rat found on April 11, 1938, in Paauhau Sector, Hamakua District, Island of Hawaii, Hawaii Territory, has been proved positive for plague.

Iraq—Baghdad.—On January 11, 1938, 1 plague-infected rat was reported in Baghdad, Iraq.

Typhus Fever

Bolivia.—During the month of March 1938, typhus fever was reported in Bolivia as follows: La Paz, La Paz Department, 3 cases; Oruro, Oruro Department, 1 case; Potosi, Potosi Department, 7 cases.

Yellow Fever

Brazil.—Yellow fever has been reported in Brazil as follows: Minas Geraes State, March 17–26, 4 deaths; Rio de Janeiro State, March 17–28, 11 deaths; Santa Catharina State, March 21–27, 7 deaths.

Senegal—Diourbel.—On April 15, 1938, 1 death from suspected yellow fever was reported in Diourbel, Senegal.

x

UNITED STATES TREASURY DEPARTMENT

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Dental Status and Needs of Elementary School Children
Experimental Studies of Vanadium Poisoning in the Rat
Effect of Nonbreeding and Foster Nursing on Mouse Tumors

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THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg Gen. ROBERT OLESEN, *Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PUBLIC HEALTH REPORTS

VOL. 53 MAY 13, 1938 NO. 19

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

March 27—April 23, 1938

The accompanying table summarizes the prevalence of eight important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the Public Health Reports under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ended April 23, the number reported for the corresponding period in 1937, and the median number for the years 1933–37.

DISEASES ABOVE MEDIAN PREVALENCE

Measles.—The number of cases of measles (147,707) reported for the weeks ended April 23 represented a decrease of approximately

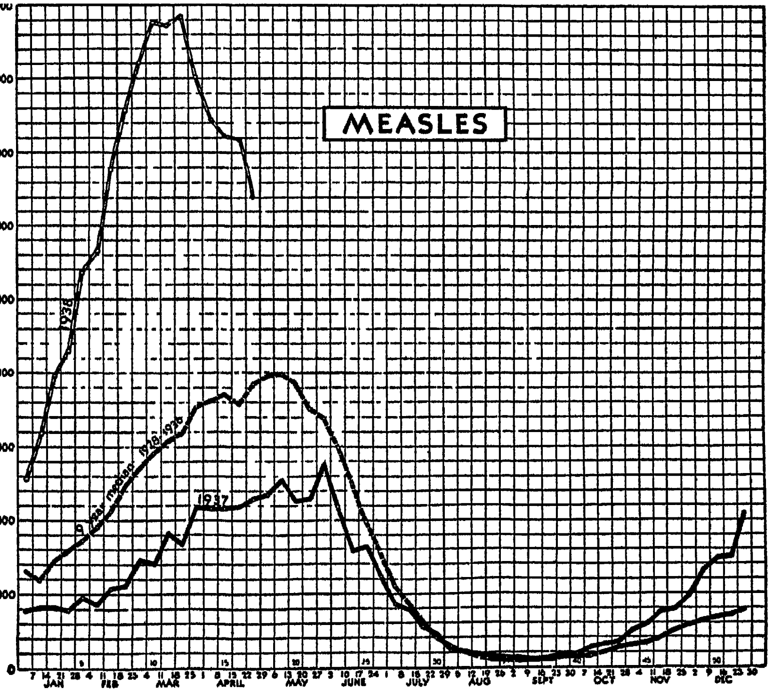

FIGURE 1.—Numbers of cases of measles reported by weeks for the first 17 weeks of 1938, for the year 1937, and for the median weeks of the 9 years 1928–36.

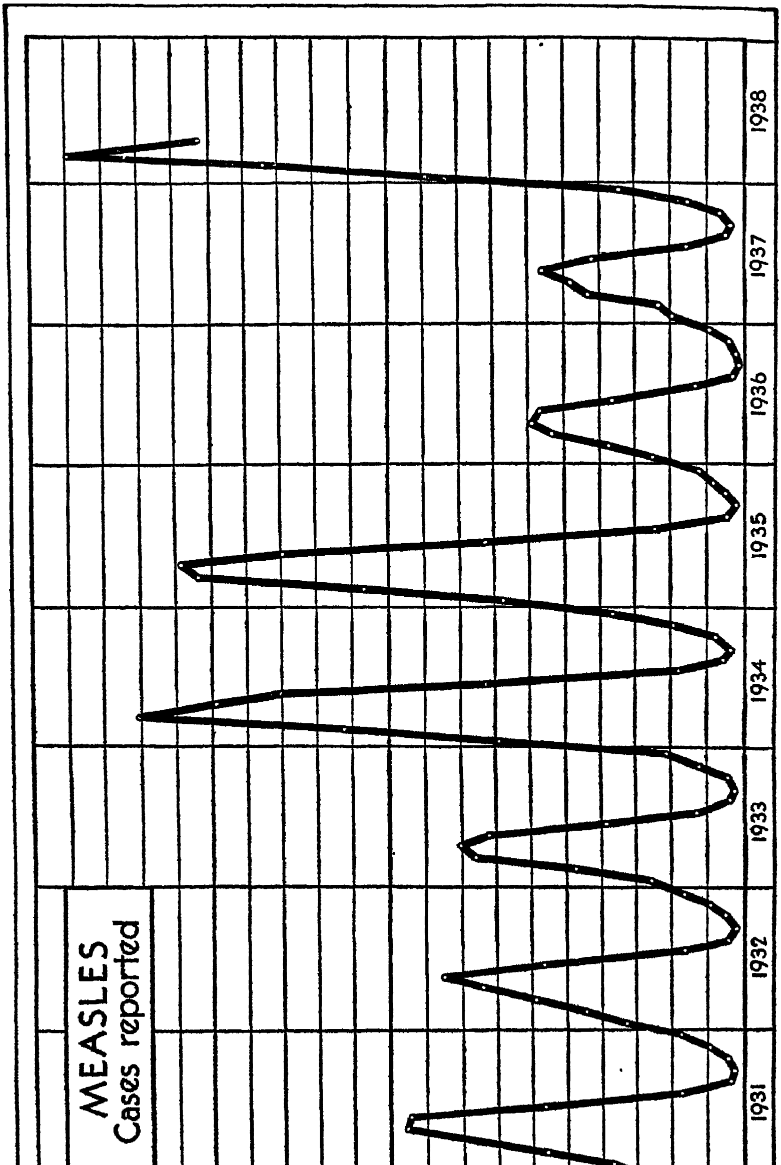

FIGURE 2.—Number of cases of measles reported, by months, January 1930–April 1938.

24,000 cases from the number reported for the preceding 4 weeks. In preceding years the seasonal peak of measles has not generally been reached until the latter part of April or the first of May, but apparently the peak of the current high incidence for the country as a whole was reached during the week ended March 26, the last week of the preceding 4-week period.

The current measles incidence has been the highest on record. While the incidence has declined considerably, the number of cases for the period under consideration is approximately three times that reported for the corresponding period in each of the 2 preceding years, and more than two times the median number reported for the corresponding period during the years 1933–37. In 1934 and 1935 the time of the peak corresponded with the current one, with a total of approximately 132,000 and 142,000 cases, respectively.

While each section of the country reported more than the average incidence for this season of the year, the highest incidence in relation to the 1933–37 median was reported from the East North Central and East South Central regions, where the incidence was more than four times the seasonal expectancy, and from the South Atlantic region, where the number of cases was almost three times the seasonal average.

Smallpox.—The number of cases of smallpox reported for the 4 weeks ended April 23 was 1,882, as compared with 1,443, 878, and 739 for the corresponding period in 1937, 1936, and 1935. The current incidence is the highest on record since 1931, when the number of cases for this period totaled 4,068. The present geographic distribution of smallpox is very uneven. The North Atlantic States are practically free from the disease and the South Atlantic States reported only six cases, which is only about 50 percent of the average incidence for that region, while the States in the West and Mississippi River Basin continue to report a relatively high incidence. Increases over the 1933–37 median range from one and one-third times the median in the West South Central region to more than six times the median in the East South Central region.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—The diphtheria incidence is the lowest on record for this period. The reported number of cases for the 4 weeks ended April 23 was 1,601. This is about 95 percent of the incidence for the corresponding period in 1937 and about 75 percent of the 1933–37 median. In the Mountain and Pacific regions the current incidence stood at about the average seasonal level, but all other regions reported a relatively low incidence.

Number of reported cases of 8 communicable diseases in the United States during the 4-week period Mar. 27–Apr. 23, the number for the corresponding period in 1937, and the median number of cases reported for the corresponding period 1933–37 [1]

Division	Current period	1937	5-year median	Current period	1937	5-year median	Current period	1937	5-year median	Current period	1937	5-year median
	Diphtheria			Influenza [2]			Measles [3]			Meningococcus meningitis		
United States [1]	1,601	1,724	2,193	4,761	14,019	7,139	147,707	45,102	72,322	275	690	659
New England	45	32	61	58	53	64	2,753	6,609	8,997	15	44	13
Middle Atlantic	336	373	394	79	125	125	42,909	18,818	26,117	52	104	104
East North Central	317	320	385	183	1,176	935	59,327	4,753	12,855	35	77	115
West North Central	111	171	231	329	577	555	7,498	575	7,122	19	28	40
South Atlantic	265	278	299	954	3,740	2,447	18,828	6,677	6,677	54	194	108
East South Central	117	111	131	455	2,400	871	6,555	1,484	1,484	62	156	53
West South Central	203	268	326	2,013	4,360	2,142	3,305	3,524	3,524	19	41	41
Mountain	64	52	60	314	270	436	3,777	1,648	1,648	9	23	11
Pacific	143	119	135	376	1,318	493	2,755	1,014	5,429	10	23	23
	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fevers		
United States [1]	72	96	77	22,199	29,478	29,478	1,882	1,443	815	457	443	568
New England	1	1	2	2,406	2,154	1,829	0	1	0	10	20	21
Middle Atlantic	11	8	8	6,845	8,162	8,361	0	1	0	63	58	58
East North Central	9	10	13	6,341	9,638	10,017	508	321	154	61	48	83
West North Central	6	5	5	2.823	5,683	2,450	558	739	271	31	18	20
South Atlantic	8	18	9	946	871	1,052	6	4	12	71	84	125
East South Central	19	15	4	409	415	415	63	5	10	58	56	56
West South Central	13	12	5	671	799	571	196	44	146	117	112	118
Mountain	1	9	2	619	677	677	144	154	86	15	19	17
Pacific	4	18	18	1,139	1,079	1,079	407	174	88	81	28	30

[1] 48 States. Nevada is excluded, and the District of Columbia is counted as a State in these reports.
[2] 44 States and New York City.
[3] 46 States. Mississippi and Georgia are not included.

Influenza.—The influenza incidence continued at a low level, with 4,761 cases reported as compared with 14,019, 31,791, and 6,922 cases for the corresponding period in 1937, 1936, and 1935. The current incidence is about 65 percent of the 1933–37 median (7,139 cases), which is the figure for this period in 1934, a year exceptionally free from influenza. The situation is very favorable in all parts of the country, each section reporting a decrease from the average seasonal expectancy.

Meningitis.—For the current period the number of cases of meningitis totaled 275, as compared with 690, 1,169, and 659 for the corresponding period in 1937, 1936, and 1935. The years 1935, 1936, and 1937, within which period the 5-year median falls (1935) were years of rather high meningitis incidence, and probably a better comparison is with the average (313 cases) for the years 1932–34, the current incidence being less than 90 percent of that figure. In the North Central and Pacific regions the incidence was the lowest on record for this period, while the Middle Atlantic, South Atlantic, West South Central, and Mountain regions reported the lowest incidence since 1924. Meningitis was unusually prevalent in the East

South Central and South Atlantic regions during this period in 1937 and 1936, and the incidence in the East South Central region is now somewhat above the seasonal average.

Poliomyelitis.—Poliomyelitis (72 cases) continued at about the average seasonal level, with the exception of the South Central regions, which reported definite increases over the normal seasonal incidence. The Pacific region has a comparatively low incidence for this season of the year, while in all other geographic areas the cases closely approximated the 1933–37 median.

Typhoid fever.—The typhoid fever incidence (457 cases) was slightly higher than during the corresponding period in 1937, but it was low in relation to the seasonal expectancy. The West North Central region reported a slight excess over the average incidence, and the South Atlantic States reported a very definite decrease; but in all other regions the incidence was about normal for this season of the year.

Scarlet fever.—The incidence of scarlet fever was below normal, with 22,199 cases reported for the 4 weeks ending April 23. More cases were reported from the New England, West North Central, West South Central, and Pacific regions than are normally expected at this season, but in all other areas the reported number of cases was relatively low. The Middle Atlantic and East North Central regions reported the lowest numbers in recent years.

MORTALITY, ALL CAUSES

The average mortality rate from all causes in large cities for the 4 weeks ending April 23, based on data received from the Bureau of the Census, is 11.8 per 1,000 estimated population (annual basis). The current rate is the lowest since 1933, when the average rate for the corresponding period was 11.3. In 1937 and 1936 the rates for this period were 12.8 and 13.3, respectively.

STUDIES ON DENTAL CARIES

I. DENTAL STATUS AND DENTAL NEEDS OF ELEMENTARY SCHOOL CHILDREN[1]

By HENRY KLEIN, *Associate Dental Officer*, CARROLL E. PALMER, *Passed Assistant Surgeon*, and JOHN W. KNUTSON, *Passed Assistant Dental Surgeon, United States Public Health Service*

INTRODUCTION

Dental caries is generally recognized as a physical impairment which exceeds in prevalence all others known to occur in children of the United States. Although the use of the toothbrush, dietary regulation, prophylactic odontotomy, and the application of chemiotherapy (silver nitrate) have been suggested and advocated, no effective method for the control and prevention[2] of caries has been accepted other than the replacement of the carious tooth structure by chemically stable filling materials. The great importance of the caries problem, particularly from a public health standpoint, stimulates inquiry concerning the possibility of developing, through research, other methods of control which are less expensive, more effective, and better adapted for widespread application by practicing dentists.

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[1] From Child Hygiene Investigations, Division of Public Health Methods, National Institute of Health, United States Public Health Service.

The need for the development of such methods has led to a detailed study of dental disease in a representative urban community. This paper, the first in a series, presents the results of a dental survey of essentially the entire elementary grade school population of the community. The findings are interpreted as demonstrating that the magnitude of the caries problem, in grade school children, is of such order as to make difficult its immediate practical handling with existing facilities and knowledge. This identification of the magnitude of accumulated carious defects in school children has led to a detailed analysis of the manner in which dental defects accumulate in the permanent teeth of children of grade school age. The results strongly suggest that a redistribution of dental services is indicated if school children, who represent approximately 15 percent of the population, are to receive adequate and effective dental care.

GROUP SURVEYED AND METHODS

The small city, Hagerstown, Md., whose grade school children were studied is located in the eastern section of the United States and has a population of approximately 30,000 persons (1930). Somewhat over 90 percent of the inhabitants are native white, and of these, 95 percent have native parents. The city contains several small manufacturing and industrial units and includes the usual retail and wholesale commercial establishments. In general, the population is representative of the broad middle range of socio-economic groups in the United States.

Approximately 95 percent of the children of grade school age attend the municipal elementary schools. The enrollment of white children in the first eight grades of these schools was, in October 1936, approximately 4,700. Of this number 4,416 received, in the spring of 1937, complete dental examinations by dental officers in the employ of the United States Public Health Service. The children examined, therefore, include 94 percent of the enrolled elementary school population. The distribution of these children, with respect to age and many other characteristics, may be considered representative of many urban communities in the United States.

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[2] Control and prevention as used in this connection is taken to mean the limitation of extension of caries and the prevention of tooth mortality rather than the prevention of the initiation of carious lesions.

The dental examinations were made with number 3 plain mirrors and fine pointed pig-tail explorers under favorable lighting conditions. Observations were made on *all* teeth present in the mouths and, in addition, unerupted and extracted permanent teeth were noted. Pits and fissures in which the explorer caught and which after thorough inspection were not considered definitely carious were noted as separate items and were not counted as caries. Teeth designated as carious were those which showed actual, although frequently small, cavities. The lesions recorded are those which are readily found on careful clinical dental examination. The extent of caries in any single tooth was measured in terms of tooth surfaces involved. When such areas extended from one surface to others, the involved surfaces were counted separately as carious surfaces. Remaining roots were considered as equal to five carious surfaces. Records for filled teeth were made in a similar manner, that is, filled surfaces were considered as past carious surfaces. Full crowns, of which few were encountered, were considered equal to five filled surfaces (five surfaces affected by past caries).

FINDINGS

Preliminary to the presentation of findings it is essential to consider briefly certain constituents which make up the caries problem and the manner in which these affect the measurement of dental status and needs in children. The first of these considerations concerns the numbers and kinds of teeth present in, or absent from, the mouths of the individuals examined. The range of age of elementary school children, approximately 6 through 15 years, covers the period during which the deciduous is being replaced by the permanent dentition. Since entirely different teeth and numbers of teeth are involved in the description of status in older as contrasted with younger children, it is essential that findings be given for specific age and sex groups and given separately for deciduous and permanent teeth. The populations of children and teeth which are utilized for a quantitative description of status and needs are given in table 1.

TABLE 1.—*Numbers of children, numbers of permanent teeth erupted, and numbers of permanent and of deciduous teeth present in the mouth, by age and sex groups among 4,416 elementary school children in Hagerstown, Md.*

Item tabulated	Sex	Age										
		6	7	8	9	10	11	12	13	14	15	All ages
Number of children	Boys	171	197	231	253	270	262	299	267	199	83	2, 232
	Girls	156	206	250	240	259	269	297	278	165	58	2, 184
Number of permanent teeth erupted	Boys	734	1, 537	2, 486	3, 352	4, 436	5, 880	7, 121	7, 023	5, 364	2, 270	39, 703
	Girls	860	1, 824	2, 987	3, 595	4, 758	6, 120	7, 490	7, 423	4, 533	1, 594	41, 184
Number permanent teeth present in the mouth.	Boys	734	1, 532	2, 479	3, 325	4, 366	5, 314	7, 030	6, 885	5, 253	2, 203	39, 121
	Girls	850	1, 818	2, 973	3, 558	4, 698	6, 049	7, 371	7, 253	4, 420	1, 548	40, 547
Number deciduous teeth present in the mouth.	Boys	2, 886	2, 794	2, 644	2, 237	1, 010	724	379	121	44	9	13, 448
	Girls	2, 498	2, 729	2, 718	1, 650	1, 123	456	223	81	14	0	11, 492

A second major consideration which influences the choice of methods of presenting the findings concerns the fact that dental caries is a cumulative disease. A precise description of status of the disease in a population group demands, therefore, a quantitative evaluation of the complete caries experience. Such an evaluation requires a full consideration of what may be termed *past* and *present* caries. Present caries may be defined as actual carious lesions which are present in the mouth at the time of examination. The term "past caries" may be used in designating those teeth that are filled and those that are missing (extracted) because of caries. For purposes of precision and brevity, the term "DMF" (decayed, missing, or filled) is introduced and used in this paper to designate the complete caries experience. This measurement of complete caries experience is obtained readily for the permanent teeth, since missing permanent teeth in children may be considered, at least for purposes of the present discussion, as the result of severe caries. An equivalent measurement of the complete caries experience in the deciduous teeth is not possible in the data collected since a definite decision may not be made as to whether a missing deciduous tooth has or has not been carious. These latter considerations emphasize again that quantitative facts regarding dental caries in children must be presented separately, and in different ways, for the deciduous and permanent dentitions.

Total caries experience (DMF) in the permanent teeth.—Details of the caries experience in the permanent teeth, expressed in terms of DMF, are given in tables 2, 3, and 4. The first of these tabulations, including the percents of children having one or more permanent teeth classified as DMF, indicates that the disease, dental caries, has attacked one or more permanent teeth in 19.9 percent of 6-year-old girls and 12.3 percent of boys of the same age. As age increases, caries in the permanent teeth becomes more prevalent until at age 14 or 15, approximately 95 percent of the children have one or more DMF permanent teeth. Of the 4,416 grade school children ages 6 through 15 years, 3,156, or 71.5 percent show a history of caries in one or more permanent teeth.

The spread of the carious condition through the population of permanent teeth is shown in table 2, which presents, by age and sex groups, the numbers of erupted permanent teeth which are DMF. Of 39,703 erupted permanent teeth in boys, 5,932, or 15.0 percent are decayed, filled, or missing; of 41,184 erupted permanent teeth in girls, 6,340, or 15.4 percent show evidence of attack by caries; of 80,887 erupted permanent teeth in the 4,416 children, therefore, 12,272 are designated as DMF. Further details of the extension of the caries experience in the population of permanent teeth are shown by the fact (table 2) that a total of 23,753 DMF surfaces are present

TABLE 2.—*Percents of children with 1 or more DMF [1] permanent teeth, numbers of DMF permanent teeth, and numbers of DMF permanent tooth surfaces, by age and sex groups. (4,416 elementary school children, Hagerstown, Md.)*

Item tabulated	Sex	Age										
		6	7	8	9	10	11	12	13	14	15	All ages
Number of children with 1 or more DMF permanent teeth.	Boys	21	57	116	174	213	218	263	220	188	82	1, 561
	Girls	31	89	144	174	201	217	260	266	159	54	1, 595
Percent of children with 1 or more DMF permanent teeth.	Boys	12. 3	28. 9	50 2	68. 8	78. 9	83. 2	88. 0	85. 8	91. 5	98. 8	69. 9
	Girls	19. 9	43. 2	56 3	72. 5	77. 6	80. 7	87 5	95. 7	96. 4	93. 1	73 0
Number of DMF permanent teeth.	Boys	43	115	255	452	646	722	1, 068	1, 065	1, 012	554	5, 932
	Girls	52	178	328	542	683	788	1, 111	1, 413	886	350	6, 340
Number of DMF permanent tooth surfaces.	Boys	59	169	365	826	1, 301	1, 334	2, 094	2, 216	2, 004	1, 191	11, 559
	Girls	66	237	470	1, 038	1, 274	1, 424	2, 161	2, 852	1, 850	822	12, 194

[1] Decayed, missing, or filled as defined in the text.

TABLE 3.—*Numbers and percents of DMF [1] permanent tooth surfaces contributed by specified corresponding permanent teeth, all ages (4,416 elementary school children, Hagerstown, Md.)*

Corresponding teeth	Number of surfaces		Percent of surfaces	
	Boys	Girls	Boys	Girls
Upper jaw:				
Central incisors	592	605	12. 0	12. 6
Lateral incisors	400	471	8. 1	9. 8
Canines	39	30	. 8	. 6
1st premolars	251	261	5. 1	5. 4
2nd premolars	244	228	4. 9	4. 8
1st molars	3, 226	2, 996	65. 2	62. 5
2nd molars	195	199	3. 9	4. 2
All teeth	4, 947	4, 790	100. 0	100. 0
Lower jaw:				
Central incisors	87	63	1. 3	. 9
Lateral incisors	66	41	1 0	. 6
Canines	8	5	0	. 1
1st premolars	46	55	. 7	. 7
2nd premolars	176	221	2. 7	3. 0
1st molars	5, 776	6, 456	87. 4	87. 2
2nd molars	458	563	6. 9	7. 6
All teeth	6, 612	7, 404	100. 0	100. 0

[1] Decayed, missing, or filled as defined in the text.

TABLE 4.—*Numbers and percents of DMF [1] permanent tooth surfaces contributed by specified tooth surfaces, all ages, all teeth (4,416 elementary school children, Hagerstown, Md.)*

Specified tooth surfaces	Number of surfaces		Percent of surfaces	
	Boys	Girls	Boys	Girls
Occlusal	4, 951	5, 264	42. 8	43. 2
Mesial	2, 014	2, 088	17. 4	17. 1
Distal	1, 657	1, 698	14. 3	13. 9
Buccal	1, 503	1, 624	13. 0	13. 3
Lingual	1, 434	1, 520	12. 4	12. 5
All surfaces	11, 559	12, 194	100. 0	100. 0

[1] Decayed, missing, or filled as defined in the text.

in the 12,272 DMF permanent teeth. The different kinds of permanent teeth which contribute DMF surfaces are indicated in table 3 which gives the numbers and percents of DMF permanent tooth surfaces by specified corresponding permanent teeth.[3]

Study of this table indicates that certain individual types of teeth contribute more carious surfaces than others. For example, 21,521, or nearly 91 percent, of all DMF surfaces in the permanent teeth of the grade school children are found in the upper and lower first molars, the lower second molars, and the upper central and lateral incisors. More specifically, 64 percent of the caries experience occurring in the upper jaw and 87 percent of that in the lower jaw is contributed by the first molars. Additional details regarding the location of carious defects in the permanent teeth are shown in table 4 which gives the numbers and percents of specific tooth surfaces which are affected. The fact may be derived from this table that 43 percent of the 23,753 DMF surfaces are found in occlusal surfaces, 31 percent in distal and mesial surfaces, and 26 percent in buccal and lingual surfaces.[4]

DENTAL NEEDS

For purposes of the present discussion the term dental needs is restricted to those professional requirements which are directly and obviously the immediate consequence of dental caries. Under this definition tooth defects which make up dental needs are contributed by present unfilled cavities in the deciduous and permanent dentitions and by missing permanent teeth. In the deciduous teeth, the measurement of dental needs is limited, for reasons given previously, to the consideration of unfilled carious teeth actually present in the mouth at the time of the examination.

Table 5 presents the details of the status of unfilled carious teeth in the deciduous dentition. In the 4,416 children observed, 2,331, or 53 percent, have one or more unfilled carious deciduous tooth. Of a total of 24,940 deciduous teeth present in the mouth, 9,943 have unfilled cavities which involve 21,191 tooth surfaces. Nearly 40 percent of the deciduous teeth present, therefore, contain unfilled cavities.

In the permanent dentition the conditions which, together, constitute dental needs as defined in this report, include all teeth with clinical histories which indicate untreated defects due to caries. The conditions which fall into this category are actual unfilled cavities, remaining roots, and missing permanent teeth. The status of these

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[3] The data are presented for corresponding teeth, since caries occurrence is bilaterally almost equal.

[4] Data given here must not be interpreted as measuring the relative susceptibility of the various teeth and surfaces to attack by caries. In explanation of this caution it need only be pointed out, as an example, that the first molar teeth contribute a large proportion of the total caries experience primarily because these teeth have erupted into the mouths of nearly all of the 4,416 children examined while the second molars, for instance, have erupted into the mouths of a much smaller proportion of children.

TABLE 5.—*Status of teeth requiring fillings in the deciduous dentition, by age and sex groups (4,416 elementary school children, Hagerstown, Md.)*

Item tabulated	Sex	Age										
		6	7	8	9	10	11	12	13	14	15	All ages
Number of children having 1 or more carious deciduous teeth requiring fillings.	Boys	139	171	214	227	220	138	86	25	17	6	1,243
	Girls	126	176	221	198	172	101	60	28	6	-----	1,088
Percent of children having 1 or more carious deciduous teeth requiring fillings.	Boys	81.3	86.8	92.6	89.7	81.5	52.7	28.8	9.4	8.5	7.2	55.7
	Girls	80.8	85.4	86.3	82.5	66.4	37.5	20.2	10.1	3.6	-----	49.8
Number of carious deciduous teeth requiring fillings.	Boys	802	958	1,198	1,042	741	354	165	44	21	8	5,396
	Girls	728	1,013	1,158	751	501	226	119	44	7	-----	4,547
Number of carious deciduous tooth surfaces requiring fillings.	Boys	1,781	2,003	2,647	2,278	1,575	711	344	104	60	25	11,528
	Girls	1,374	2,138	2,595	1,571	1,057	517	293	105	13	-----	9,663

several components of the problem of dental needs is summarized in table 6. The section of the table giving the numbers and percents of children having one or more unfilled cavities in the permanent teeth shows that as age advances the proportion of children having such cavities increases. Of the 4,416 children examined, a total of 2,617, or nearly 60 percent, require one or more fillings in the permanent teeth. A total of 7,989 permanent teeth require the treatment of 11,802 tooth surfaces by fillings. Additional details of the status of dental needs shows that a total of 330 permanent teeth have remaining roots which require extraction and that a total of 1,219 permanent teeth are missing (extracted). When these are combined (9,538 teeth), it is indicated that 76.6 percent of all teeth giving a clinical history of caries must be considered in a broad discussion of the problem of dental needs in the permanent dentition.

TABLE 6.—*Status of teeth requiring fillings in the permanent dentition, by age and sex groups (4,416 elementary school children, Hagerstown, Md.)*

Item tabulated	Sex	Age										
		6	7	8	9	10	11	12	13	14	15	All ages
Number of children having 1 or more carious permanent teeth requiring fillings.	Boys	19	56	102	148	178	180	223	190	162	76	1334
	Girls	27	81	124	146	151	169	199	206	135	45	1283
Percent of children having 1 or more carious permanent teeth requiring fillings.	Boys	11.1	28.4	44.2	58.5	65.9	68.7	74.6	71.2	81.4	91.6	59.8
	Girls	17.3	39.3	48.4	60.8	58.8	62.8	67.0	74.1	81.8	77.6	58.7
Number of carious permanent teeth requiring fillings.	Boys	40	108	204	346	456	484	671	630	688	406	4033
	Girls	41	151	254	386	419	402	644	799	509	231	3956
Number of carious permanent tooth surfaces requiring fillings.	Boys	56	141	264	545	709	727	1028	996	962	594	6022
	Girls	47	184	327	601	641	638	917	1215	847	363	5780
Number of permanent teeth having only remaining roots.	Boys	-----	-----	3	8	18	11	30	22	37	31	160
	Girls	-----	-----	1	18	8	15	35	39	31	23	170
Number of children having 1 or more missing (extracted) permanent teeth.	Boys	-----	5	5	22	49	50	63	88	78	40	400
	Girls	1	6	10	27	42	51	76	107	68	28	416
Percent of children having 1 or more missing (extracted) permanent teeth.	Boys	0.0	2.5	2.2	8.7	18.1	19.1	21.1	33.0	39.2	48.2	17.9
	Girls	0.6	2.9	3.9	11.3	16.2	19.0	25.6	38.5	41.2	48.3	19.0
Number of permanent teeth missing (extracted).	Boys	-----	5	7	27	70	66	91	138	111	67	582
	Girls	1	6	14	37	60	71	119	170	113	46	637

Summarizing the dental needs for both dentitions, it is found that approximately 10,000 deciduous and 8,000 permanent teeth contain unfilled cavities. Defects in these 18,000 teeth affect approximately 21,000 deciduous and 12,000 permanent tooth surfaces. In addition to the total of 33,000 defective untreated surfaces, 7,745 permanent tooth surfaces have been lost because of severe caries.

Fillings in the permanent and deciduous teeth.—The data previously presented indicate that all except a very small segment of a representative elementary school population shows attack by caries in the permanent teeth and that approximately three-fourths of all teeth attacked show no objective evidence of treatment. Tables 7 and 8 give the amount and extent of fillings in the permanent and the deciduous dentitions. Among the 4,416 children, 436 boys and 547 girls have one or more permanent teeth filled. Of 5,932 DMF permanent teeth in boys and 6,340 DMF permanent teeth in girls, 23.4 percent and 29.2 percent, respectively, have been filled. Of 11,559 DMF surfaces in boys, 1,860 surfaces are filled. Of 12,194 DMF surfaces in girls, 2,422 are filled. Approximately 16 and 20 percent of the DMF surfaces in boys and girls, respectively, are replaced by fillings. In the deciduous dentition, 270 teeth and 396 surfaces are filled in 111 boys; 248 teeth and 353 surfaces are filled in 102 girls. It is thus apparent that in all of the children examined less than one-fourth of the permanent tooth surfaces which have been affected by caries experience show objective evidence of reparative treatment, and that a much smaller proportion of carious deciduous teeth present in the mouth show a similar evidence of treatment.

TABLE 7.—*Status of filled teeth in the deciduous dentition, by age and sex groups (4,416 elementary school children, Hagerstown, Md.)*

Item tabulated	Sex	Age										
		6	7	8	9	10	11	12	13	14	15	All ages
Number of children having 1 or more filled deciduous teeth.	Boys	17	20	15	15	26	13	3	1	1	-----	111
	Girls	15	17	16	15	22	11	3	3	-----	-----	102
Percent of children having 1 or more filled deciduous teeth.	Boys	9.9	10.2	6.5	5.9	9.6	5.0	1.0	0.4	0.5	-----	5.0
	Girls	9.6	8.3	6.3	6.3	8.5	4.1	1.0	1.1	-----	-----	4.7
Number of filled deciduous teeth.	Boys	51	54	41	37	57	24	4	1	1	-----	270
	Girls	45	43	45	32	54	21	4	4	-----	-----	248
Number of filled deciduous tooth surfaces.	Boys	85	77	67	46	78	35	6	1	1	-----	396
	Girls	67	62	64	38	79	33	6	4	-----	-----	353

An analysis of DMF surfaces in the permanent teeth of those boys and girls who have one or more fillings in these teeth shows (table 8) the presence of 3,244 DMF surfaces in 436 boys and 4,537 DMF surfaces in 547 girls. Since it is shown also that a total of 1,860 and 2,422 permanent tooth surfaces are filled in these boys and girls, respectively, it is revealed that reparative treatment has been supplied for 57.3 percent of the DMF surfaces in this particular group of boys and 53.4 percent of the DMF surfaces in this group of girls. This analysis of the distribution of reparative treatment indicates that a relatively small group of children (983) receive all of such treatment given; yet only one-half of their needs are supplied. Of all the children examined, 3,160 have one or more permanent teeth showing a history of caries. Of these, 983 have one or more filled teeth, the remaining 2,197 children exhibit no evidence of treatment for their carious defects. It may be stated, therefore, that carious defects in the permanent teeth are treated fairly adequately in one-fifth and are entirely neglected in one-half of the 4,416 grade school children.

TABLE 8.—*Status of filled teeth in the permanent dentition by age and sex groups (4,416 elementary school children, Hagerstown, Md.)*

Item tabulated	Sex	Age										
		6	7	8	9	10	11	12	13	14	15	All ages
Number of children having 1 or more filled permanent teeth.	Boys	2	2	22	32	49	68	89	86	64	22	436
	Girls	4	10	27	45	68	85	110	118	58	22	547
Percent of children having 1 or more filled permanent teeth.	Boys	1.2	1.0	9.5	12.6	18.1	26.0	29.8	32.2	32.2	26.5	19.5
	Girls	2.6	4.9	10.5	18.8	26.3	31.6	37.0	42.4	35.2	37.9	25.0
Number of filled permanent teeth.	Boys	3	3	45	86	128	183	320	307	228	86	1,389
	Girls	10	22	65	127	219	272	364	463	225	85	1,852
Number of filled permanent tooth surfaces.	Boys	3	3	51	109	155	227	466	426	311	109	1,860
	Girls	14	24	71	164	297	364	479	600	293	116	2,422
Percent of DMF[1] permanent teeth that are filled.	Boys	7.0	2.6	17.6	19.0	19.8	25.3	30.0	28.8	22.5	15.5	23.4
	Girls	19.2	12.4	19.8	23.4	32.1	34.5	32.8	32.8	25.4	23.7	29.2
Percent of DMF[1] permanent tooth surfaces that are filled.	Boys	5.1	1.8	14.0	13.2	11.9	17.0	22.3	19.2	15.5	9.2	16.1
	Girls	21.2	10.1	15.1	15.8	23.3	25.6	22.2	21.0	15.8	14.1	19.9
Number of DMF[1] permanent tooth surfaces among children having 1 or more filled permanent teeth.	Boys	3	5	80	138	268	349	784	753	627	237	3,244
	Girls	15	25	89	249	420	612	908	1,186	724	309	4,537
Percent of DMF[1] permanent tooth surfaces filled among children having 1 or more filled permanent teeth.	Boys	100.0	60.0	63.8	79.0	57.8	65.0	59.4	56.6	49.6	46.0	57.3
	Girls	93.3	96.0	79.8	65.9	70.7	59.5	52.8	50.6	40.5	37.5	53.4

[1] Decayed, missing, or filled as defined in the text.

ANALYSIS

The data just presented offer quantitative support for the frequently encountered observation that defects due to dental caries in childhood constitute a health problem of major proportions. The problem of caring for these defects is of such complex character and magnitude as to justify attempts to clarify the more important issues involved. A clarification of one aspect of the problem may be facilitated by an analysis of the manner in which carious defects develop and accumulate in the permanent teeth.

Caries in the permanent teeth of children 6 years of age may be viewed as an accumulation of defects which have been added each year up to age 6. Carious defects at 7 years of age may be considered equal to those which have accumulated at age 6, plus the *increment* of new defects which have appeared between the 6th and 7th years of age. For example, in the 6-year-old girls examined during the survey, 42.3

DMF surfaces per 100 girls had accumulated in the permanent teeth. In the 7-year-old girls, 115.0 DMF surfaces per 100 girls were observed. The difference in caries experience, 72.7 DMF surfaces per 100 children, represents the increase or increment of defects which appeared between the 6th and 7th years of age. From this point of view, a total yearly increment of defects for the entire elementary school population may be visualized as equal to the sum of annual increments for each age-sex group from 6 through 15 years. Such a total yearly increment may be interpreted as a reasonably accurate measurement of new carious defects which appear each year in the population of school children. Estimates[5] of the increments for each separate age-sex group, and the total yearly increment for the entire school population, are shown in table 9. The results indicate that 5,859 carious tooth surfaces represent the estimated increment of new defects in the permanent teeth which may be expected to appear each year in a representative group of 4,416 grade school children. This annual increment, it is postulated, would account for the finding (table 2) of 23,753 DMF surfaces in the elementary school children at the time of the survey. Expressed in somewhat more general terms the analysis indicates that a representative group of grade school children have an average of nearly five and one-half carious permanent tooth surfaces per child (23,753 DMF surfaces in 4,416 children) and that this accumulation of defective surfaces is maintained, as children enter and leave the school group, by a yearly increase of approximately one and one-third new carious surfaces per child per year (approximately 6,000 new DMF surfaces per year in 4,416 children).[6]

According to the perspective of this analysis, it is clearly implied that the basic problem of giving care for carious defects in the permanent teeth is the problem of caring for the yearly increments of defects. In a parallel manner, and more fundamentally, the problem of controlling the initiation of dental defects is the problem of eliminating these yearly increments.

On the basis of the analysis just made, it becomes pertinent to relate the yearly increment of new defects to an analogous estimate of the amount of care now given each year for carious defects in the permanent teeth of the children. Such an estimate of dental care may be obtained by the same method of analysis as was used to determine the total yearly increment of new defects. Basic data which may be used for the calculation of an annual increment of filled surfaces are given in table 6. The analysis, although not shown in detail here, indicates that the filling of approximately 1,000 permanent tooth surfaces per year in the mouths of 4,416 children would result in the finding of 4,282 filled surfaces at the time of the survey. Since, as was shown in table 9, approximately 6,000 permanent tooth surfaces develop caries each year it becomes apparent immediately that the filling of permanent tooth surfaces is being accomplished at a rate which is about one-sixth of the rate at which the defects are accruing. Identification of this disparity between the rate of development of defects and the rate of placement of fillings largely explains, in quantitative terms, the existence of the present accumulated dental *needs* of the children studied and leads to the conclusion that if such an accumulation of untreated defects in the permanent teeth is to be avoided in the future some provision should be made to give elementary school children (in the form of fillings alone) approximately six times the amount of service that they now receive

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[5] It is appreciated by the authors that some influence in depressing the tendency towards new caries, or extensions of caries, may be contributed by the process of filling carious teeth.

[6] Insofar as the children studied may be considered representative of grade school children in the United States generally, and insofar as this estimate of the total yearly increment may be considered accurate, these figures furnish the basis for estimation of dental requirements for the permanent teeth of that segment of the population which attends the elementary schools.

TABLE 9.—*Data for the calculation of the increment of new carious (DMF)*[1] *surfaces which may be expected to arise annually in the permanent teeth of 4,416 elementary school children in Hagerstown, Md.*

Item tabulated	Sex	Age										
		6	7	8	9	10	11	12	13	14	15	All ages
Observed number of DMF[1] surfaces present in the mouth, per 100 children.	Boys	34.5	85.8	158.0	326.5	481.9	509.2	700.3	830.0	1,007.0	1,434.9	-----
	Girls	42.3	115.0	183.6	432.5	491.9	529.4	727.6	1,025.9	1,121.2	1,417.2	-----
Difference between age specified and previous age in observed number of DMF[1] surfaces present in the mouth, per 100 children.	Boys	34.5	51.3	72.2	168.5	155.4	27.3	191.1	129.7	177.0	427.9	-----
	Girls	42.3	72.7	68.6	248.9	59.4	87.5	198.2	298.3	95.3	296.0	-----
Expected number of new carious (DMF)[1] surfaces between age specified and previous age (item tabulated directly above times number of children in specified age groups).	Boys	59.0	101.1	166.8	428.8	419.6	71.5	571.4	346.3	352.2	355.2	2,869
	Girls	66.0	149.8	175.6	597.4	153.8	100.9	588.7	829.3	157.2	171.7	2,990

[1] Decayed, missing, or filled as defined in the text.

Information afforded by the above analysis may be considered in the light of professional dental facilities available in the community. At the time of the survey there were 32 dentists practicing in the city. It may be assumed that some of these dentists allocate more time for the treatment of children than others. However, a number of useful purposes may be achieved by expressing dental service in terms of an equal distribution of work by the entire group of 32 practitioners. For example, on the basis of the estimate of 1,000 permanent tooth surfaces filled per year, it appears that, on the average, each dentist fills approximately 30 permanent tooth surfaces each year in the mouths of the children. On the basis of the estimate that approximately 6,000 new carious surfaces appear in the permanent teeth each year, it may be postulated that the care of the yearly increment of defective surfaces would require the filling of approximately 190 surfaces per year per dentist in order to *prevent the accumulation* of untreated defects. An attempt to care, during the course of one calendar year, for the present accumulation of 11,802 defective surfaces[7] in the permanent teeth of 4,416 children (table 6) would require the placement of fillings in approximately 370 surfaces by each dentist. In connection with this last estimate, if an attempt were made to care for the present accumulation of defects, *plus* those which it is estimated would accrue during the year, it may be postulated that over 500 permanent tooth surfaces would need to be filled during the course of the year by each dentist.

Perhaps additional information of value may be derived from this analysis of professional dental services if the estimates are expressed in terms of *time* requirements. For this purpose, it seems reasonable to make the assumption that 1 hour,[8] on the average, of professional time would be required to care adequately for each defective permanent tooth surface. In addition, it may be satisfactory for present purposes to assume that each dentist works a total of 1,800[9] hours per year.

The acceptance of these two assumptions makes possible the following general estimates of dental services for the permanent teeth of grade school children:

1. The filling of 500 surfaces, which represents the estimated number of defective surfaces that are present now plus those that would be expected to accrue during 1 year, means that nearly 30 percent of the professional services of the community would be required during 1 full year if an attempt were made to provide the present elementary school population with complete dental treatment in the form of fillings for the permanent teeth.

2. The filling of 30 surfaces per year per dentist, which is the estimate of service now given the children, means that somewhat less than 2 percent of the total professional time of the dentists practicing in the community is devoted to the filling of permanent teeth in that 20 percent of the population which attends the elementary schools.

3. The filling of 190 permanent tooth surfaces per year per dentist, which is equivalent to the estimated increment of defects which appear each year, means that approximately 10 percent of the professional time available in the community would be needed to prevent

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[7] No provision being made to extract remaining roots or to restore missing permanent teeth.

[8] It is recognized that the location of surfaces to be filled may considerably influence the time required for placing fillings or for providing other indicated treatment. Since the immediate purpose of this discussion is chiefly the dissection of the problem of supplying dental needs due to caries, the estimates of professional services required are arbitrarily stated. Thus, if more or less than 1 hour is estimated for the treatment of each carious surface, the total services required would be proportionately changed.

[9] This estimate of working hours per year is used by Strusser in a recent publication (New York State Journal of Dental Hygiene, 8: 51 (1938)).

the accumulation of defects in the permanent dentition of the school children.

This summary, although obviously based on arbitrary estimates of professional time requirements, provides some clarification of the problem of supplying dental services for the permanent teeth of school children.[10] First, it seems necessary to conclude that the magnitude of the present accumulation of dental needs in the permanent teeth alone is of such order as to make exceedingly difficult its immediate practical handling with existing facilities. Second, it seems reasonable to expect that provision should be made for handling the yearly increment, the care of which is estimated to require approximately 10 percent of the professional time of the dental practitioners of the city. Third, care for the yearly increase in new defects appears to involve a six-fold increase over the time now given to the filling of permanent teeth in the school children.

SUGGESTIONS FOR PROVIDING MORE NEARLY ADEQUATE DENTAL CARE

The analysis given in the preceding statements may be used as the basis for suggesting procedures by means of which it *may* be possible to give more nearly adequate dental treatment for the permanent teeth of grade school children. One such procedure may be predicated on two assumptions: First, that it is highly desirable to *prevent the accumulation* of untreated defects; and, second, that each dentist of the community be willing to assume a proportionate share of the professional labor involved.

On the basis of these assumptions, the following suggestions are offered in connection with certain aspects of the operation of a rational plan [11] designed for the specific purpose of preventing the accumulation of dental defects in the permanent teeth of grade school children. During the initial year of operation of the plan complete dental treatment would be supplied for all carious defects in the permanent teeth of all children in the first grade of the elementary schools. During the following year, complete care would be provided for caries appearing in the permanent teeth of all new first-grade children and for the increment of new carious defects appearing in the second-grade pupils who were treated the preceding year. During each of the succeeding third, fourth, fifth, sixth, seventh, and eighth years, accumulated defects in first-grade children entering the school population during these respective years would be treated and new increments of defects, contributed by each grade treated in earlier years, would be given dental care. It is apparent, therefore, that the suggested plan provides that complete dental care be given for each group of new first-grade children plus treatment for new increments of caries appearing in the permanent teeth of the children, as they progress from lower to higher school grades. After the operation of the plan for 8 years, all grades of the elementary school population will have received, systematically, treatment for yearly increments of defects.

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[10] An equivalent analysis of the problem of supplying care for the deciduous teeth is difficult, since in many instances the short life expectancy of these teeth does not justify extensive reparative dental work. It is appreciated, of course, that a considerable amount of professional service is necessary if the deciduous teeth are to be given adequate dental care.

[11] This plan includes no provision for the treatment of accumulated defects in the *present* group of elementary school children nor does it include a provision for the treatment of defects in the deciduous teeth. Furthermore, the plan is not designed to control those unknown yet basic factors which give rise to carious defects.

According to the records of the survey, approximately 400 permanent tooth surfaces in the first-grade children are estimated to require repair. During the initial year of operation of the plan, fillings would need to be placed in these children's teeth at a rate of 12 permanent tooth surfaces per dentist. During the second year, the placement of fillings in 30 permanent tooth surfaces by each dentist would be required to care for the carious defects in new first-grade pupils and for the estimated 600 new carious permanent tooth surfaces which would be expected to appear in the second-grade pupils. By the end of the eighth year, services equivalent to the placement of fillings in 200 surfaces per year per dentist would be necessary to care for all of the yearly increments of defects appearing in the children of all eight grades.

If it be assumed that 1 hour is required for the filling of each carious surface, it may be estimated that the order of only two-thirds of 1 percent of the available professional dental services of the community would need to be utilized in giving complete care for defects in the permanent teeth of the first-grade pupils. During the second year 1.67 percent of the professional services would be required to care for the new first-grade pupils and the second-grade children. Each successive year of operation of the plan would involve the use of a slightly higher percentage of the professional facilities until the eighth year, when 10 percent of the existing professional services would be required to care for the annual increment of the entire grade school population. Thus, one feature of this plan is that the demands on the existing dental services are gradually increased, beginning at a very minimum (two-thirds of 1 percent) and gradually increasing until the eighth year, when 10 percent is required to care for that 15 percent of the population which attends the elementary schools.

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EXPERIMENTAL VANADIUM POISONING IN THE WHITE RAT[1]

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As part of a study conducted for the purpose of determining the nutritional significance of vanadium, observations were made of the tolerance level of this element in the diet and symptomatology and pathology of vanadium fed animals.

Sodium metavanadate was incorporated into the stock ration of rats in amounts calculated to bring the level of vanadium to 12.5, 25, 100, 200, and 400 parts per million, respectively. Upon subsequent chemical analysis,[2] the sodium metavanadate (C. P. grade) was found to be 92 percent pure, the impurity being practically all absorbed CO_2. Thus, the actual amounts of vanadium in the diets fed were 11.5, 23, 92, 184, and 368 parts per million, respectively. The stock ration into which the vanadate was mixed consisted of whole wheat 650 parts, whole milk 250, meat scraps 100, and sodium chloride 13 parts. These diets were fed *ad lib* to healthy young rats 3 to 4 weeks old, weighing between 34 and 50 grams. Five of these young animals originally receiving the diet containing 23 p. p. m. of vanadium were transferred at the end of 12 weeks to the ration supplemented with 368 p. p. m. of vanadium. Control animals, taken from the same litters, were maintained at the same time on the unsupplemented ration. Food records were kept in all cases.

The diets supplemented with higher levels of vanadium proved very disagreeable to the animals and their normal food intake was markedly affected. In order to determine whether the restricted growth of animals on these diets was due entirely to inanition caused by a lowered food consumption or in part to the effects of the vanadium itself, animals, paired as to litter, weight, and sex with the vanadium-fed rats, were given the normal ration without vanadium and the food intake was so controlled that both groups received the same quantity.

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[1] Vanadium is used as a mordant in the dye industry and more extensively as a hardener in the manufacture of certain steels. The important ores are vanadinite, carnotite, and descloizite.

Anemia, cachexia, respiratory irritation, diarrhea, and emaciation have been reported as due to vanadium poisoning in workers in these industries. There is little information as to the frequency of industrial poisoning. (Bull. U. S. Bur. Lab Stat. No. 582.)

Very few previous studies have been made on the toxic action of vanadium salts, and most of these have been confined to pharmacological and gross anatomical findings.

This paper gives certain basic data as to tolerance levels for ingestion of vanadium salts and as to histologic effects of acute and subacute poisoning.—Ed.

[2] The vanadium was reduced to the quadrivalent state with SO_2 followed by expulsion of this gas with CO_2 and titration of the hot solution with $KMnO_4$.

The results of experiments in which the vanadium was incorporated in the ration at different levels are summarized in tables 1 and 2.

TABLE 1.—*Response of rats to different amounts of vanadium incorporated in the ration as $NaVO_3$*

Vanadium in diet	Number of rats		Initial age	Length of test period [1]	Gain in weight [2]		Deaths		Total vanadium ingested [2]		Observations
	Male	Female			Male	Female	Male	Female	Male	Female	
P. p. m.			*Weeks*	*Weeks*	*Gm.*	*Gm.*			*Mg.*	*Mg.*	
11.5	1	2	3-4	9	217	116	0	0	8.3	6.1	Apparently normal. No significant evidence of stimulation by V. All lived until end of experiment.
23	9	5	3-4	10	192	114	0	0	17.5	14.4	Apparently normal. 3 males and 2 females placed on 368 p. p. m. V at end of 12 weeks. Others killed at end of 10th week.
92	5	1	3-4	10	138	66	0	0	67.3	43.0	Slight symptoms of poisoning. 1 male and 1 female placed on stock ration at end of 12th week for later feeding of V by stomach tube. 4 killed at end of 16th week.
184	7	2	3-4	10	107	86	0	0	107.5	91.4	All but 1 male showed definite symptoms of poisoning. 2 males and 2 females killed at end of 10th week. 4 males killed at end of 15th week. 1 male retained for further experiment.
368	5	4	3-4	[3] 10	−14 −6 −9 24 21	−11 −11 42 54 -----	6th day 12th day 7th week ---------- ----------	6th day 6th day ---------- ---------- ----------	4.1 17.3 69.2 133.6 139.0	4.2 5.2 134.6 144.3 -----	Marked symptoms of poisoning. 2 males and 2 females lived until end of 10th week.
	[4] 3	[4] 2	16	[3] 10	−100 −103 −62	−48 −10 -----	7th week 9th week ----------	7th week ---------- ----------	122.2 185.4 325.0	108.2 251.1 -----	Marked symptoms of poisoning. 1 male and 1 female lived until end of 10th week.
0	8	7	3-4	10	202	117	0	0	0	0	Normal controls.

[1] The length of the test period considered in computing average gains in weight and total vanadium ingested. Some of the animals were kept on the experiment for a longer time for various reasons, as indicated under the heading "Observations".

[2] Averages except in the case of animals receiving 368 p. p. m. V, in which case individual values are given.

[3] Or until time of death.

[4] Animals formerly receiving 23 p. p. m. V in the diet for 12 weeks.

On vanadium levels of 11.5 and 23 p. p. m. all of the animals appeared normal throughout the experiment. Higher levels of vanadium caused loss in weight and gross pathological symptoms, the severity of which progressed with the greater doses of the element. This is shown by the fact that on vanadium levels of 92 and 184 p. p. m. the animals exhibited definite symptoms of vanadium poisoning, but all of them lived to the end of the experimental period while 5 of the 9 young rats given the ration containing 368 p. p. m. of vanadium died. Three of the five older animals transferred to this diet after previously receiving 23 p. p. m. of vanadium for 12 weeks also succumbed (table 1).

TABLE 2.—*A comparison of the average weight gains of paired rats on normal and on vanadium supplemented rations after the ingestion of the same quantities of food*

[All quantities given in grams]

Food intake	11.5 p. p. m. V group and controls				23 p. p. m. V group and controls				184 p. p. m. V group and controls				368 p. p. m. V group[2] and controls			
	Male (1 pair)[1]		Female (2 pairs)		Male (3 pairs)		Female (3 pairs)		Male (2 pairs)		Female (2 pairs)		Male (2 pairs)		Female (2 pairs)	
	On V diet	On control diet	On V diet	On control diet	On V diet	On control diet	On V diet	On control diet	On V diet	On control diet	On V diet	On control diet	On V diet	On control diet	On V diet	On control diet
50	24	21	24	20	21	18	18	15	12	13	14	13	0	7	5	9
100	48	42	44	42	42	37	35	32	21	27	27	27	5	21	14	16
150	68	59	53	57	55	56	45	43	34	40	36	39	6	29	23	26
200	85	77	68	68	70	71	58	53	48	51	47	51	-----	-----	30	40
300	123	106	88	90	108	106	78	71	70	86	55	68	-----	-----	38	52
400	152	136	104	108	136	136	95	84	82	110	63	82	-----	-----	-----	-----
500	182	166	115	116	157	158	111	103	102	120	-----	-----	-----	-----	-----	-----
600	202	181	-----	-----	177	175	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
700	214	-----	-----	-----	192	191	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

[1] The control rat could not be induced to eat as much food during the same period of time as the animal receiving the vanadium supplement.

[2] 5 pairs could not be included in this summary because of the deaths of 3 males and 2 females on the vanadium supplemented diet. None of the control animals died, indicating that starvation was not the primary cause of death.

Table 2 shows a comparison of the average weight gains of the vanadium-fed animals and their paired controls at different levels of food intake. From these data it may readily be observed that, with greater ingestion of vanadium, the animals made smaller gains for a given level of food intake. This evidence, together with the fact that none of the paired control rats died, indicates that inanition was not the primary cause of death of animals receiving diets containing 368 p. p. m. of vanadium.

Proescher, Seil, and Stillians (*4*) have reported that one or two administrations of tolerated doses of vanadium either *per os* or injection produced a rapid increase in body weight. With a continuation of these doses they found that the animals began to lose weight, although this loss was never sufficient to bring the weight below that recorded for the animal at the beginning of the experiment. Several French investigators, cited by Lyonnet, Martz, and Martin (*3*) have reported on the therapeutic effects of small doses of vanadium in a number of diseases. In the amounts which were fed in the present experiments, there is no significant evidence to indicate a stimulating effect of small quantities of this element. For a time it was felt that the appetites of the rats on the low levels of vanadium were more pronounced, and on occasions it was difficult to get the paired control animals to eat the same quantity of food. However, experiments on a larger number of animals would be necessary before the slight differences which were obtained in these experiments could be considered significant.

The incorporation of the supplement into the ration has certain distinct advantages, chief of which is that it offers the most natural introduction of the material for a nutritional consideration. However, since the amount of supplement ingested depends upon the quantity of food eaten, and no two animals eat the same amount, the results are difficult to summarize. Furthermore, in cases such as the present one, in which a disagreeable ration limits food intake, the quantity of supplement ingested falls below the desired level. For these reasons, solutions of sodium metavanadate (found by analysis to have a purity of 92 percent (see footnote 2, p. 764)), and sodium orthovanadate (not analyzed) were fed to a number of rats by stomach tube. The solutions were made up (account being taken of the determined purity of $NaVO_3$) so that 1 cc contained 2 mg of vanadium, and daily doses of 2 and 4 mg, respectively, of vanadium were given to a total of 83 rats, ranging in weight from 40 to 350 gm. Pathological examinations were made of a large number of these animals; and to avoid post mortem changes in the tissues, many of them were killed in a moribund condition. Since these animals were not expected to live more than a few hours longer, their records have been summarized with those which were left to die from the poisoning.

Table 3 gives a summary of the results obtained when solutions containing 2 or 4 mg of vanadium were administered daily by means of a stomach tube to rats of different weights. Of the 83 animals in these experiments, only one (a male receiving sodium ortho-vanadate) lived to the end of the 10-week experimental period. Another male died during the sixth week, two others during the fourth week, while another lived until the third week of the experiment. All of the remaining animals either died or would have succumbed (had they not been killed in moribund condition) some time between the second and thirteenth day. Most of them died on the second or third day.

TABLE 3.—*Effects of 2 and 4 milligrams of vanadium administered daily to rats of different weights by means of stomach tube*

Form of vanadium administered	Weight groups	Number of rats		Time of death[1]				Total vanadium[1] administered				Percentage of initial weight lost			
				Male		Female		Male		Female		Male		Female	
		Male	Female	Range	Average	Range	Average	Range	Average	Range	Average	Range	Average	Range	Average
Aqueous solution $NaVO_3$	*Grams*			*Days*	*Days*	*Days*	*Days*	*Mg*	*Mg*	*Mg*	*Mg*	*Pct.*	*Pct.*	*Pct.*	*Pct.*
	0-100	5	8	3- 4	3	2- 4	3	4.0- 8.0	6.0	4.0- 8.0	5.5	20-25	22	8-24	20
	100-200	[2] 13	26	2- 5	3	2-13	3	5.5-20.0	11.2	8.0-36.0	11.0	7-26	14	2-19	12
	200-300	[3] 19	2	2- 8	3	2	2	8.0-28.0	10.6	8.0	8.0	8-28	16	6- 9	7
	300-350	4	0	3-11	7	-----	-----	12.0-38.0	24.5	--------	----	16-29	22	-----	-----
Na_3VO_4	0-100	[4] 4	2	3- 4	3	3- 6	4	6 - 8	7.3	4 -16	10	21-26	23	20-35	28

[1] In a number of instances this summary includes animals which were killed in moribund condition for pathological examination.

[2] 2 from this group were very irregular and were not included in the summaries. 1 died during the fourth week after a total vanadium intake of 64 mg and a gain of 7 gm, the other died during the sixth week after a total vanadium consumption of 81 mg and a gain of 4 gm.

[3] 1 from this group died during the fourth week after a total vanadium intake of 82 mg and 25 percent loss in weight. A second died during the third week after consuming a total of 82 mg of vanadium and losing 16 percent in weight.

[4] 1 from this group was killed the tenth week after taking 130 mg of vanadium and gaining 100 gm in weight.

On an average it required approximately 6 mg of vanadium given daily in 2-mg doses to cause the death of animals weighing less than 100 gm, and about twice this amount to exceed the tolerance level of those weighing 100 to 300 gm. The heavier animals, 300 to 350 gm, lived for a longer period, during which they received a greater total quantity of vanadium. The loss of weight in this latter group averaged about 22 percent and was very similar to the percentage weight loss in the young animals. Those weighing from 100 to 200 gm and from 200 to 300 gm averaged a smaller percentage weight loss, although in all groups there was great individual variation.

It is customary to determine toxicity by injection of the material under investigation instead of administering it *per os.* The latter method is more difficult to control and gives such variable results that it is generally considered unsuitable. However, from the standpoint of a nutritional problem it is desirable to introduce the substance orally. Again, repeated doses given over a period of time may act differently from single massive doses and the repeated ingestion of small amounts more nearly approaches the way in which an animal naturally receives harmful substances in its food. Proescher, Seil, and Stillians (*4*) reported the lethal dose of sodium ortho-vanadate for rats injected subcutaneously to be 50–60 mg V_2O_5 per kilogram (2.8 to 3.4 mg V per 100 gm); of ammonium metavanadate to be 20 to 30 mg V_2O_5 per kilogram (1.1 to 1.7 mg per 100 gm); and of sodium vanadate 10 to 20 mg V_2O_5 per kilogram (0.6 to 1.1 mg V per 100 gm). They found the toxic dose of ammonium metavanadate and sodium ortho-vanadate for rabbits injected intravenously to be 1.5 to 2 mg V_2O_5 per kilogram (0.43 to 1.12 mg V per 100 gm) and 2 to 3 mg V_2O_5 per kilogram (1.12 to 1.68 mg V per 100 gm), respectively. Franke and Moxon (*1*) observed that intraperitoneal injections of sodium metavanadate caused the death of 75 percent of their animals (young, healthy rats weighing between 125 and 175 grams) within 48 hours when administered in doses equivalent to 0.4–0.5 mg of the element per 100 grams and that toxic symptoms were produced by feeding (*2*) n amounts of 50 parts per million of sodium metavanadate. Priestley (*5*) found the fatal dose of the pentoxide administered subcutaneously in rabbits in the form of sodium ortho-vanadate to be between 9.18 and 14.66 mg per kilogram (0.5 to 0.8 mg V per 100 gm). From a comparison of these observations with those of the present study there is evidence that vanadate given orally is better tolerated than intravenous or intraperitoneal injections.

After oral administration of vanadium to a human subject, Proescher, Seil and Stillians (*4*) observed that the elimination of this element took place quickly and quantitatively; about 87.6 percent was passed through the feces, and the remainder was voided in the urine. From these observations it appears that only about 12 percent of the vanadium given orally is ever absorbed, a possible explanation for the apparently increased tolerance of oral doses over those administered by injection.

The effects of oral ingestion of vanadium are not cumulative as evidenced by a comparison of the total vanadium intake of the various animals shown in tables 1 and 3. The daily dose of vanadium for those fed by stomach tube was sufficient in most cases to exceed the tolerance level, and death of the animal resulted in a very short time. On the other hand, the daily quantity of vanadium which the animals received as a part of their food mixture was a tolerated amount. However, after a period of several weeks many of the rats in this latter group had ingested a total quantity of vanadium far in excess of the amount which produced death in the animals fed by stomach tube. Had the toxic effects of the element been significantly cumulative, these animals could not have tolerated any such total quantity as many of them did with few or no outward signs of poisoning. It was also observed that rats poisoned by toxic levels of vanadium in the diet over a long period of time very soon appeared normal again when placed on the stock diet. Subsequently they showed no difference in reaction to large doses of vanadium from other animals of approximately the same weight that had never received this element.

Acute symptoms of vanadium poisoning appeared almost immediately in rats receiving vanadium solutions by stomach tube. These animals appeared extremely nervous, violently clawed their cages, and rubbed their noses in evident distress. On the second day, those rats receiving the larger doses of vanadium (4 mg daily) showed a hemorrhagic exudate from the nose and marked diarrhea, which continued to grow worse until death. Frequently there was a hemorrhagic discharge from the intestine. Often paralysis of the hind legs occurred. After labored respiration and a series of convulsions, death usually resulted in these animals on the second or third day.

Chronic symptoms were observed in animals receiving vanadium as a part of their food mixture. They were substantially the same as the acute symptoms, although much less marked in degree. Since toxic levels of vanadium definitely retarded appetite, the severity of these symptoms was restricted by a reduced food intake and at times would almost completely disappear only to reappear when a state of inanition once more compelled an increased food intake. This state of inanition superimposed on the condition occasioned by the poisoning left extremely weakened, emaciated animals which generally died in a state of coma.

Examination of the animals immediately after death regularly revealed a stomach, cecum, and intestinal tract greatly distended with gas. Very frequently there was evidence of inflammation in the ileum, often accompanied by a number of ulcers ranging in diameter from 1 to 2 mm. The spleen appeared abnormally small; otherwise there were no outstanding gross abnormalities observed.

Priestley *(5)*, in 1875, described visceral and intestinal congestion in dogs, cats, and rabbits, sometimes with focal mucosal hemorrhage and occasionally small injected intestinal ulcers. Heimberger *(6)* also noted polypnea, lassitude, and cramps and soiling of mice parenterally injected with $NaVO_3$ or $H_4V_6O_{17}$, followed by intestinal congestion and bloody stools at autopsy.

Tissues from 57 rats were examined in the course of this study, together with similar tissues from 9 rats on the same diets which had received no vanadium salts. Most of the animals died, or were killed when moribund, 2 to 4 days after the first daily dose of sodium vanadate. Nine were taken 5 to 12 days after the first daily dose, while 5 lived 3 to 8 weeks.

Tissues were fixed in Orth's fluid and hardened in alcohol, also in 10 percent formalin for study of fatty changes. The following organs were studied routinely: Brain and spinal cord, often spinal ganglia, bone marrow of tibia and vertebrae, spleen, liver, kidney, adrenal, stomach, small and large intestines, pancreas, heart, lung, and testicle or ovary and adnexa. Orth-fixed tissues were sectioned in paraffin and stained with iron chloride hematoxylin and picrofuchsin and with alum hematoxylin and eosinate of polychrome methylene blue. Spleen sections were also stained for iron by the Perl-Abbott ferrocyanide procedure. Bones were decalcified briefly in 5 percent formic acid, which allowed satisfactory marrow staining. Frozen sections of heart, liver, kidney, and adrenal were stained with alum hematoxylin and Sudan IV and with Nile blue sulphate, and were also examined under polarized light.

In 8 control animals and 1 rat that died 30 minutes after its first dose of sodium vanadate the proventriculus and fundus of the stomach were normal. One control rat and 10 vanadium rats showed purulent inflammation of the proventriculus characterized by the formation of intraepithelial vesicles and pustules leading sometimes to ulceration and often accompanied by subjacent polymorphonuclear infiltration and edema. In 42 vanadium rats the proventriculus was normal. The fundus often showed a little eosinophil leucocyte infiltration of mucosa and submucosa near the proventricular border, both in vanadium and in control rats. This was pronounced in only 8 vanadium rats and in 1 control. Some congestion of superficial vessels in the fundus mucosa was noted in 9 vanadium rats, all from the 2- to 4-day period.

The incidence of the purulent proventriculitis seen does not appear to be significantly greater than in the control series.

One of the most interesting findings in the animals dying after short periods of administration is an acute desquamative enteritis. The villi are moderately to intensely congested, their stroma sometimes contains numbers of leucocytes, and the columnar epithelial cells on their tips are partially separated, rounded, and evidently desquamating. Sometimes suppurative ulceration of the tips of the villi is seen, but more often small pyogenic ulcers appear overlying the agminated lymphoid follicles. When present in the sections, these follicles quite regularly show germinal center hyperplasia with rather marked accumulation of free and phagocytosed nuclear debris during the acute stages. There is a more or less copious surface exudate composed of desquamated epithelial cells, leucocytes, clumps of pus, and blood in decreasing frequency in the order mentioned. Table 4 shows that this enteritis is commonest and most severe in animals dying after 2 to 4 days of vanadium administration.

TABLE 4.—*Incidence of enteritis*

Day of death	Number of rats	Normal	Slight	Moderate	Severe	With ulcers
Second to fourth	40	6	4	10	20	7
Fifth to twelfth	8	5	1	2	0	0
Thirteenth to eighty-second	5	2	1	1	1	0
Controls	10	9	1	0	0	0

Dowdeswell *(7)* noted only congestion of the intestinal mucosa.

The colon is often normal, sometimes shows slight to moderate congestion of the mucosa, infrequently some rounding and desquama-

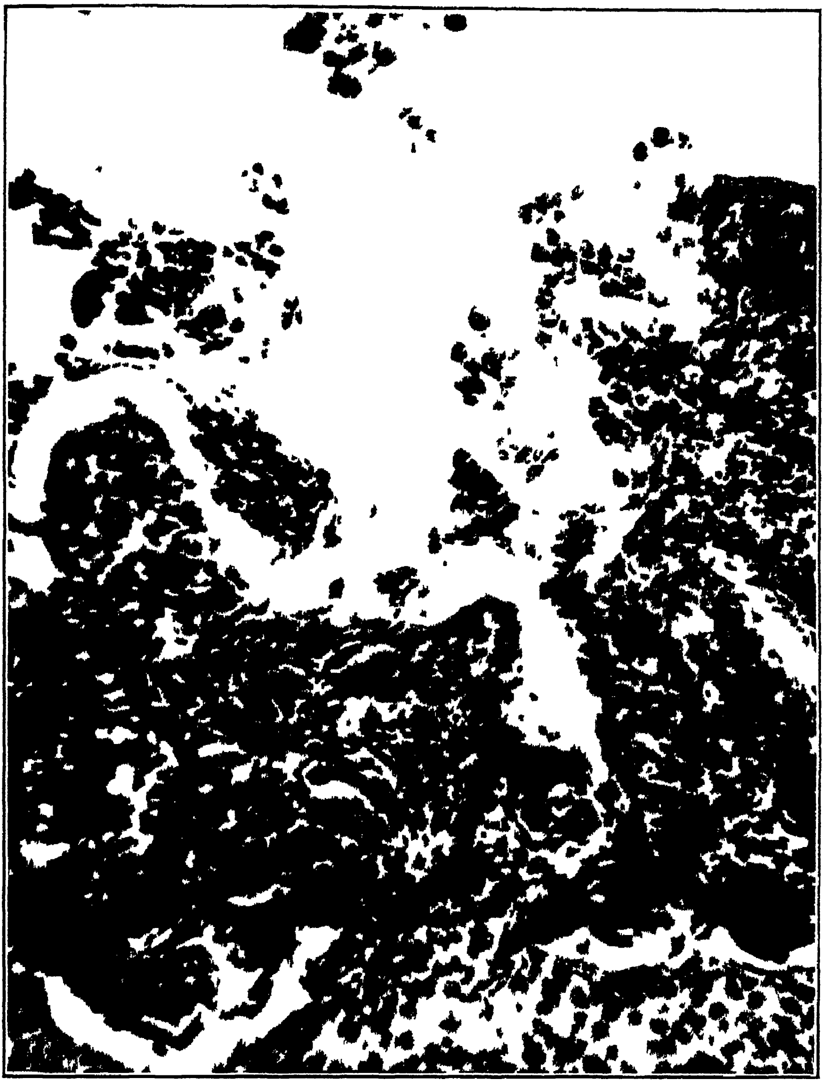

FIGURE 1.—Mucosa of small intestine, epithelial desquamation on villi (Approx. × 500)

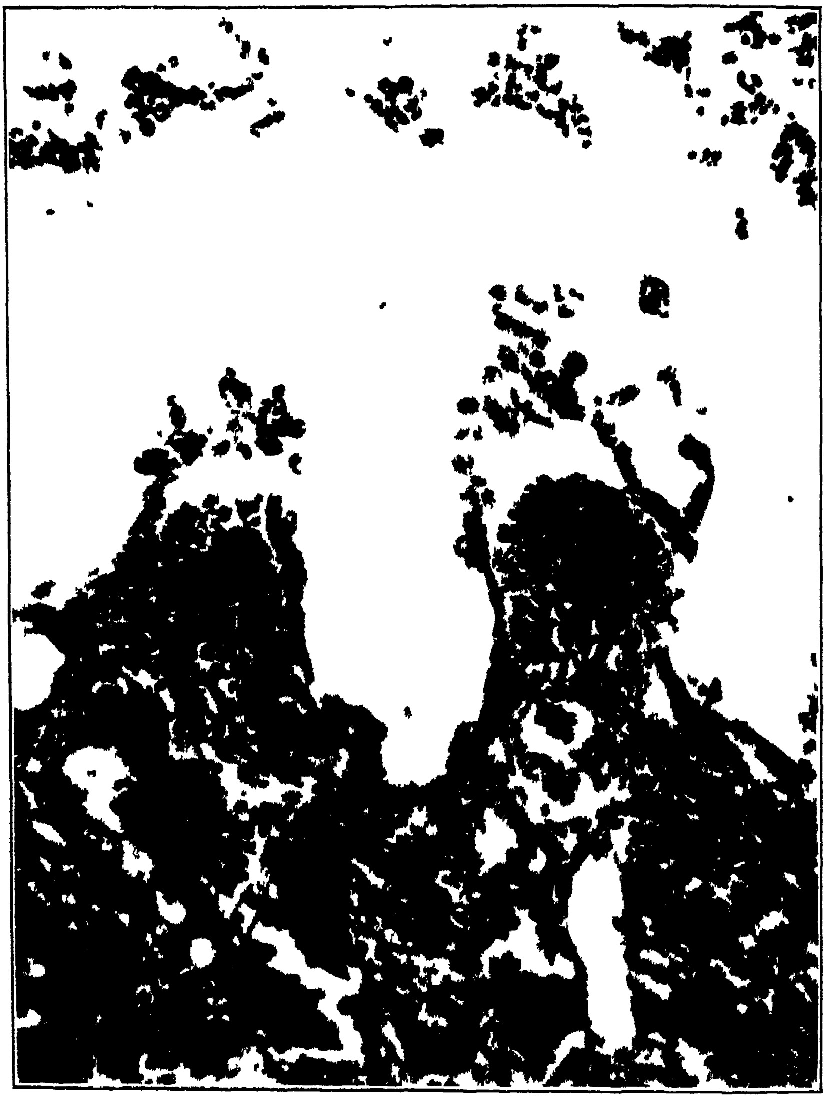

FIGURE 2.—Mucosa of small intestine, epithelial desquamation, mixed purulent, sanguinous and epithelial exudate. (Approx. [illegible]00.)

tion of the surface epithelium, and often some increase in mucus secretion.

In the liver the two significant findings were congestion and the appearance of fine droplets of neutral fat in the liver cells. Congestion was more marked in the centers of the lobules and most frequent in animals dying after 2 days, decreasing sharply after the third day. Fatty changes in the liver cells were variable in intensity and extent. Fine fat droplets were often confined to the peripheral part of the cytoplasm, extending to involve the entire cytoplasm but not the nucleus. In many animals fatty changes were localized in the periportal zones, in others in the centers of the lobules and in others in irregularly distributed areas. Severity of these changes was greatest on the third day.

TABLE 3.—*Incidence of congestion and fatty metamorphosis in the liver by days*

Day of death	Number of rats	Normal, fat-free	Congestion				Fatty metamorphosis			
			−	±	+	++	−	±	+	++
Second	25	0	4	5	12	4	4	9	6	6
Third	12	0	2	6	3	1	1	3	4	4
Fourth to sixth	8	2	3	2	1	0	0	2	2	2
Seventh to twelfth	5	0	8	0	2	0	0	8	2	0
Thirteenth to eighty-second	6	1	8	1	1	0	1	1	3	0
Control	10	8	1	1	0	0	1	0	1	0

Dowdeswell has also noted a fatty metamorphosis in the liver after administration of vanadium salts in various animals. This was accompanied by congestion of capillaries, decrease in liver pigment, and apparently by karyolysis of liver cells with granular cytoplasmic degeneration (in carnivores).

The pancreas was studied in 26 vanadium-treated and 4 control rats and was normal in all.

The heart muscle showed an inconstant cloudy swelling, usually slight to moderate in grade, more frequent and more pronounced in animals dead 2 and 3 days after beginning vanadium treatment than later. Muscle fibers were often cloudy and contained fine eosinophilic granules in their cytoplasm, sometimes totally, more often partially, obscuring the cross striations. In the majority the cross striations were quite distinct at 300 X magnification. Severity of this change did not vary much with the stage of the intoxication, but was definitely greater than in control material. The presence of usually few fine fat droplets in the muscle fibers was noted in 4 vanadium-treated and 1 control rat, a not materially different frequency.

In about 70 percent of the rats dead in 2 to 4 days the lungs showed more or less marked congestion, with hemorrhages into the alveoli in a minor proportion. In the 5- to 12-day period, congestion is less frequent and less marked when present, and after 13 days it is slight or absent. The control rats showed no pulmonary congestion. Noteworthy perivascular lymphocyte infiltration is probably less frequent than in normal rats. Changes such as purulent bronchitis, abscesses, peribronchial lymph follicle hyperplasia, and intrafollicular phagocytic activity appear to be at least no more frequent than in the control rats.

Renal changes are generally slight, are at their maximum in the 2-day group, and, though decreasing thereafter in frequency and intensity, persist throughout. They consist in swelling and finely granular degeneration of the epithelium of the convoluted tubules, with formation of fine basal droplets of largely neutral fat in a variable proportion of the tubules, more often in the proximal group, and in a decreasing proportion of rats with longer duration of the intoxication. In a few rats a few doubly refractile lipoid crystals were found. In many rats, particularly in the later stages, many basally striated, brush bordered tubules were present. In the control series some rats showed finely granular changes in part, but not all, of the convoluted tubules, but fatty changes were regularly absent. More severe degenerative changes did not occur at any stage.

The adrenals show a quite marked reduction in the fat and lipoid content of the cortex, moderate amounts being present in a minority of the animals in the 2-day group, and very little thereafter. In the 2- and 3-day groups most of the rats show a more less pronounced congestion of the inner part of the adrenal cortex, with focal hemorrhage in about one-third of the congested cortices. Some chromaffin persists in the medulla in some animals of the 2-day group, while it is absent thereafter.

Testis and epididymis were examined in 31 vanadium-treated and 5 control rats. They were generally normal with active spermatogenesis. Acute desquamative degeneration was found in 3 experimental rats and 1 control rat.

Ovaries and adnexa were studied in 17 vanadium-treated and 5 control rats. Adnexa were normal in all. In about half of the rats in the 2-to 4-day period corpora lutea were more or less congested, and one showed focal hemorrhage in lutein tissue.

Skeletal muscle was generally normal in both experimental and control rats.

Splenic follicles show an average decrease in size, most marked in the 5- to 12-day period, but the presence of germinal center proliferative activity is less altered, showing a little decrease in the 3- to 4-day period only. Nuclear fragmentation and phagocytosis of nuclear debris by follicle reticulum cells is slight or absent in control rats, while in many vanadium-treated rats it is quite prominent, particularly after 2 and 3 days, less later.

The blood content of the spleen pulp is quite definitely decreased in rats succumbing after 2 to 12 days of vanadium treatment. Later there seems to be an increase toward normal. The lymphocyte content of the spleen pulp is definitely reduced after 2 days, and more so in the 3- to 12-day period. At the same time there is a relative increase in prominence of pulp reticuloendothelium and a moderate to marked hemosiderosis (see table 6).

TABLE 6.—*Hemosiderin content of spleen pulp*

Day of death	Number of rats	−	Trace	±	+	++	+++
Second	25	0	1	2	4	11	7
Third to fourth	15	0	0	0	6	5	4
Fifth to twelfth	9	0	0	1	1	2	3
Thirteenth to eighty-second	5	0	0	2	1	0	2
Control	10	1	3	1	4	1	0

The bone marrow is usually congested after 2 days of vanadium treatment, less often after 3 days, and infrequently thereafter. Fat content of the upper tibial marrow is somewhat increased in animals treated 3 days or longer. In the 2- to 4-day period there is a fairly pronounced decrease in numbers of metamyelocytes and polymorphonuclear leucocytes, sometimes with the appearance of moderate numbers of myeloblasts. Later maturation of leucocytes is increased but does not reach normal. Similarly the numbers of eosinophil granulocytes is reduced, on the average, in the early period, and a less marked reduction in number of normoblasts is noted. Numbers of megakaryocytes are quite variable and apparently little altered. Numbers of tissue mast cells are seen in the marrow of the tibial shaft, sometimes very numerous, sometimes none. Variations in their numbers cannot be correlated with the vanadium poisoning.

The brain and spinal cord showed an inconstant, usually moderate, capillary congestion, particularly of the gray substance, which was most frequent in the 2- to 4-day period and decreased in frequency thereafter. Less often tigrolysis of nerve cells in stem ganglia of the brain and anterior horns of the cord was present, again more frequently in the 2- to 4-day period. Swelling and vacuolation of nerve cells was an infrequent finding in either brain or cord, and was usually seen in the early period.

Spinal ganglia were examined in 31 vanadium-treated and 6 control rats and were normal in all.

TABLE 7.—*Congestion and cell degeneration in central nervous system*

BRAIN

Vanadium treatment	Normal	Congestion				Tigrolysis stem ganglia			Nerve cell vacuolation			Total
		−	±	+	++	−	±	+	−	±	+	
2 days	9	0	5	8	3	8	5	3	13	2	1	25
3-4 days	4	0	5	6	0	10	0	1	10	0	1	15
5-12 days	4	1	1	3	0	2	2	1	5	0	0	9
13-82 days	2	0	2	0	1	3	0	0	3	0	0	5
Controls	10	0	0	0	0	0	0	0	0	0	0	10
Total	29	1	13	17	4	23	7	5	31	2	2	64

SPINAL CORD

Vanadium treatment	Normal	Congestion			Tirgolysis			Nerve cell vacuolation			Total	Spinal ganglia normal
		−	±	+	−	±	+	−	±	+		
2 days	12	1	3	10	5	3	4	12	1	1	26	15
3-4 days	6	2	0	8	7	0	1	10	0	0	16	11
5-12 days	6	0	1	1	1	1	1	2	0	0	8	3
13-82 days	4	1	0	0	0	0	1	0	0	1	5	2
Controls	9	0	0	0	0	0	0	0	0	0	9	6
Total	37	4	4	19	13	4	7	24	1	2	64	37

SUMMARY

Sodium metavanadate in amounts to give 11.5, 23, 92, 184, and 368 parts per million, respectively, of vanadium in the ration of rats produced toxic symptoms at the three highest levels. The animals receiving 11.5 and 23 p. p. m. showed no gross symptoms of poisoning. Deaths occurred in the group given 368 p. p. m. of vanadium.

Doses of 2 to 4 mg of vanadium administered daily by means of stomach tube as solutions of sodium metavanadate or sodium orthovanadate caused acute poisoning and death of rats weighing between 40 and 350 grams. Animals under 300 grams usually died sometime between the second and fourth day, while the heavier animals lived for a slightly longer period.

There was no evidence of a cumulative effect from vanadium ingestion. Provided the daily tolerance level was not exceeded, many animals receiving a total quantity of vanadium far in excess of the lethal dose lived for weeks, some in an apparently normal condition.

Symptoms accompanying acute vanadium poisoning are immediate nervous reactions indicative of intense distress, hemorrhagic exudate from the nose and intestines, marked diarrhea, often paralysis of the hind legs, labored respiration, and a series of convulsions followed by death. Chronic symptoms were much the same as the acute, although less marked. With higher levels of vanadium the food intake of the rats decreased and a state of starvation superimposed on the condition of chronic poisoning frequently left extremely weakened, emaciated animals which generally died in a state of coma.

Pathologically, acute sodium vanadate poisoning in rats produces an acute desquamative enteritis, with congestion of villi and some leucocyte exudation; congestion and mild fatty degeneration of the liver; congestion and sometimes focal hemorrhage in the lungs; slight parenchymatous and often fatty degeneration of the renal convoluted tubules, more severe in the proximal group; congestion, often hemorrhage and lipoid decrease in the adrenal cortex; and chromaffinolysis in the adrenal medulla. The spleen is reduced in size; its follicles are small and show karyorrhexis and phagocytosis of nuclear debris; the blood and lymphocyte content of the pulp is reduced, and there is usually a more or less pronounced hemosiderosis. The bone marrow shows an early congestion and a decrease in maturation of leucocytes, sometimes with myeloblast increase. The brain and cord often show congestion in the early stages, less often tigrolysis in stem nuclei and anterior horn cells.

REFERENCES

(*1*) Franke, K. W., and Moxon, A. L.: A comparison of the minimum fatal doses of selenium, tellurium, arsenic, and vanadium. J. Pharmacol. and Exp. Therapeutics, **58**: 454–459 (1936).

(*2*) Franke, K. W., and Moxon, A. L.: The toxicity of orally ingested arsenic, selenium, tellurium, vanadium, and molybdenum. J. Pharmacol. and Exp. Therap., **61**: 89–102 (1937).

(*3*) Lyonnet, Martz, and Martin: De l'emploi therapeutique des sels de vanadium (metavanadate de soude). Lyon med., **90**: 289–302 and 363 (1899).

(*4*) Proescher, F., and Seil, H. A., and Stillians, A. W.: A contribution to the action of vanadium with particular reference to syphilis. Am. J. Syphilis, **1**: 347 (1917).

(*5*) Priestley, J.: On the physiological action of vanadium. Tr. Roy. Soc. **166**: 495–556. (Read on Nov. 18, 1875.)

(*6*) Heimberger, Christina: Injektonsversuche an Katzen und Mäusen mit Vanadinsalzlösungen und Staubinhalationsversuche an Katzen mit Vanadiumpentoxyd. (Inaug. Diss.) Becker, Wurzburg, 1929.

(*7*) Dowdeswell, G. F.: On the structural changes which are produced in the liver under the influence of the salts of vanadium. J. Physiol., **1**: 257 (1878–9).

THE INFLUENCE OF NONBREEDING AND FOSTER NURSING UPON THE OCCURRENCE OF SPONTANEOUS BREAST TUMORS IN STRAIN C_3H MICE[1]

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The occurrence of spontaneous mammary gland tumors in breeding females of strain C_3H has been recorded in an earlier paper (*1*), in which the finding was reported that the mice have a high incidence of such tumors at an average age of 8 to 9 months. The present report deals with the occurrence of mammary gland tumors in nonbreeding females of the same strain. The study was undertaken for two reasons: First, to determine the influence of pregnancy and lactation upon the incidence and the time of appearance of mammary tumors in mice of this strain; and, second, to ascertain the incidence of such tumors in nonbreeding females of the strain before using them as material for investigations in which it is desirable to eliminate any variables introduced by pregnancy.

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[1] From the Office of Cancer Investigations, U. S. Public Health Service, Harvard Medical School, Boston, Mass.

The report also includes the results, to date, of a foster nursing experiment in which mice of strain C_3H were employed. The findings are presented here for comparison with the incidence of breast tumors in breeding and nonbreeding females of the same strain.

REPORTS OF OTHER INVESTIGATORS

The occurrence of mammary tumors in nonbreeding female mice has received attention from a number of investigators. Lathrop and Loeb (*7*), in 1913, came to the conclusion that breast cancer occurred in a larger number of breeding than nonbreeding mice, and that the tumors arose at a later age in the nonbreeding animals. Of special interest is their observation that the number of mammary cancers which arose in nonbreeding mice varied in different strains. In a later paper (*8*) the same authors again stated their conclusion as follows: "Breeding increases the tumor incidence in mice and makes the tumors appear at a lower age." Slye (*15*), in an abstract of a paper read before the American Association for Cancer Research, stated that "mammary neoplasms are about as common in unmated females as in the mated, and in this series they occur at a rather earlier age." Lynch (*9*) reported the breast tumor incidence in two strains of mice: In strain 1194 there was an incidence of 65 percent in breeding and 20 percent in nonbreeding, while in her line of Bagg albinos there was an incidence of 28 percent in the breeding and of 4 percent in the nonbreeding. Cori (*5*) found that "strain 3" mice showed a breast cancer incidence of 94 percent in breeding at an average age of 9 months and of 78.5 percent in nonbreeding at an average age of 14 to 15 months. Marsh (*10*) reported similar findings in "strain 3" breeding and nonbreeding mice.

Murray (*11*), in a comprehensive study of strain D (dilute brown) mice which have been inbred since 1909, found that the average tumor age in breeding females was 10.6 months. He mentioned 1,318 breeders which developed breast tumors and 934 which did not. These figures indicate a 58.52 percent tumor incidence for this strain. In a later paper (*13*) with Little, the breast tumor incidence in nonbreeding strain D mice was found to be 50.84 percent at an average age of 16.7 months (according to table II in their report). Murray and Little (*14*) also found that strain D, "after 20 years of inbreeding was developing tumors of the breast in 80 to 90 percent of the breeding females," and Murray (*12*) has recently recorded the tumor incidence as 65 to 100 percent in breeding females and about 50 percent in the nonbreeding females. Korteweg (*6*), in a study of the same strain of mice which was under observation in Holland, stated "there is but little difference in frequency or date of the development of cancer between dil. brown females which have and those which have not had litters." Bittner (*2, 3*) concluded from his study of strain A mice, which have been inbred since 1921, that the breeding females exhibited a breast tumor incidence of 83.2 percent at an average age of 11.5 months and the nonbreeding females showed a breast tumor incidence of but 4.5 percent at an average age of 18.5 months.[2]

Suntzeff, Burns, Moskop, and Loeb (*16*) have also determined the breast tumor incidence of breeding and nonbreeeding females of strains D and A. For strain D they reported an incidence of 51.5 percent in breeding and 6.4 percent in nonbreeding at an average age of 9.9 months and 13.5 months, respectively. For strain A they recorded an incidence of 43.1 percent for breeding and 4.5 percent for nonbreeding at an average age of 12.6 months and 14.7 months, respectively. Of interest to this report are their observations of strain C_3H mice, in which they found an incidence of 60.8 percent in breeding and 2.5 percent in nonbreeding at an average age of 10.9 months and 9 months, respectively. Their publication is, apparently, the only previous report on the breast tumor incidence in strain C_3H nonbreeding females, and in this connection they concluded that, "In strain C_3H the incidence of tumors in nonbreeding mice was very low." It should be pointed out that in their table I, dealing with nonbreeding mice, is a column in which are included "Mice without tumors," and under this heading is included the "Average age living or dead." It is possible that all the mice had not lived their span of life before publication of the table.

From the preceding review, it is clear that the various investigators are not in agreement as regards the relative tumor incidence in breeding and nonbreeding female mice. Those who are inclined to believe that the tumor incidence is greater in the breeding than in the nonbreeding females attribute the difference to the added stimulation the mammary glands receive during pregnancy. The majority of the authors are agreed that the average age in which breast tumors appear is greater in nonbreeding than in breeding mice. The striking difference in the incidence of tumors in the nonbreeding mice of highly inbred strains, such as strain D (over 50 percent), and strain A (4.5 percent) is evidence of a variation in susceptibility according to the difference in strain.

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[2] The average tumor age of nonbreeding females was kindly supplied by Dr. Bittner in a personal communication.

BREAST TUMOR INCIDENCE IN STRAIN C3H NONBREEDING AND BREEDING FEMALE MICE

In a single experiment 117 female mice of strain C_3H were separated from males at the time the litters were weaned. They were kept under the same conditions as the breeding females but in different cages. Five died without tumor at the ages of 6.5, 13, 14, 18, and 18.5 months, respectively. All the remaining animals (112, or 95.7 percent) developed spontaneous mammary gland tumors at an average age of 11.5 months. The results obtained in mice of different generations are presented in table 1, where they can be compared with the tumor data of breeding mice of the same generation. The nonbreeding mice of the F_{14} and F_{15} generations compare favorably with the breeding mice so far as tumor incidence is concerned, but in both generations the average age at which tumors appeared was higher in the nonbreeding than in the breeding. It may be concluded that in strain C_3H mice pregnancy hastens the appearance but does not influence the incidence of spontaneous breast tumors.

TABLE 1.—*Summary of all breeding and nonbreeding females in completed generations F_9 to F_{15} of strain C_3H mice*

Generation	Total number of mice	Number that died without tumor	Number that developed spontaneous breast tumor	Percent that developed tumor	Average age at which tumor appeared (in months)
F_9 Breeding	50	11	39	78.0	9.90
F_{10} Breeding	70	9	61	87.1	10.50
F_{11} Breeding	79	6	73	92.4	9.26
F_{12} Breeding	85	2	83	97.6	9.98
F_{12} Nonbreeding	12	0	12	100.0	11.70
F_{13} Breeding	115	7	108	93.9	8.51
F_{13} Nonbreeding	6	0	6	100.0	13.33
F_{14} Breeding	65	3	62	95.3	8.72
F_{14} Nonbreeding	57	2	55	96.4	11.29
F_{15} Breeding	75	2	73	97.3	8.57
F_{15} Nonbreeding	42	3	39	92.8	11.42

The table also includes a summary of all breeding females of the F_9 to F_{15} generations which are now completed and which may be regarded as a continuation of the earlier report (*1*). It is seen that breeding strain C_3H females continue to exhibit a high incidence of spontaneous breast tumors at an average age of 8 to 9 months. There has not been any change in the breeding procedures, diet, or handling of these mice since publication of the previous communication.

In view of differences in the average age at which breast tumors appear spontaneously in mice of different lines of the same inbred strain (*1*), it is believed that in any experimental procedure dealing with such growths it is essential to use litter mate controls. Accordingly, 51 breeding litter mates were kept as controls for 71 of the nonbreeding mice. These 142 mice represented the offspring from 43 litters. The results are summarized in table 2.

TABLE 2.—*Summary of nonbreeding and breeding sister controls of 43 litters of strain C_3H mice*

	Total number of mice	Number that died without tumor	Number that developed spontaneous breast tumor	Percent that developed tumor	Average age at which tumor appeared (in months)
Nonbreeding	71	0	71	100	11.5
Breeding	51	0	51	100	9.5

In table 2 it is seen that the nonbreeding mice and their breeding litter mates developed breast tumors at an average age of 11.5 months and 9.5 months, respectively. It will be noted that the average tumor age of the breeding mice is somewhat higher than in the recent generations of strain C_3H. This may be due to the influence of delayed breeding. As stated previously (*1*), the breeding procedure is to keep the females of each litter in a cage with a brother from the time they are weaned, which usually results in their becoming pregnant at a relatively early age. The 51 breeding mice recorded in table 2 were removed from their brothers when weaned at 1 month of age and were not mated until 2 or 3 months had elapsed. They are not included in the figures of table 1. It is of interest to record that of the 43 mothers of the mice included in table 2, 40 developed spontaneous mammary gland tumors at an average age of 8.5 months. The influence of delayed breeding upon the age incidence of breast tumors in strain C_3H mice is receiving further consideration.

INFLUENCE OF FOSTER NURSING UPON THE INCIDENCE OF BREAST TUMORS IN STRAIN C_3H MICE

Bittner (*3*, *4*) has shown that mother's milk may be responsible for the occurrence of spontaneous breast tumors in mice. In his experiments, newborn mice of a strain with a high incidence of breast tumors were removed from their mothers and suckled by mice belonging to strains with a low incidence of breast tumors, and it was found that in these fostered mice, and in their offspring, the incidence of breast tumors was low. Such findings suggest that some agent (or agents) is transmitted in the mother's milk which exerts a decided influence upon the occurrence of breast cancer in mice.

A preliminary report on the results of an experiment along similar lines is included in this paper, since strain C_3H mice were used and the results thus far obtained can be compared with the incidence of breast tumors in breeding and nonbreeding females of the same strain. Newborn mice of strain C_3H were foster nursed by strain C57 black mice which, under ordinary conditions, are very resistant to the development of spontaneous mammary gland tumors (*13*). After the mice had been weaned they were bred to their brothers and treated the same as other mice in the strain C_3H colony. There were 51 strain C_3H in the experiment, and the results recorded herein are as of March 1, 1938, when all the surviving animals were from 13 to 13.5 months of age. Of the 51 mice, 11 or 21.5 percent, developed breast tumors at an average age of 9.9 months. Since practically all breeding C_3H females and 76 percent of nonbreeding C_3H females develop breast tumors when 13.5 months old, it is apparent that foster nursing exerted a pronounced influence upon the occurrence of mammary gland tumors in the experimental mice. The results, thus far, confirm Bittner's findings.

In the same experiment there were 44 C57 black mice which were nursed by strain C_3H mice; and of these, 7 have died without tumor. Of the remaining 37 mice, which were 13 to 13.5 months old, none had developed a tumor.

It is desirable to emphasize that the findings reported here are not final and are presented at this time to show that Bittner's work has been confirmed in part. The final results will be presented in detail in a future report.

SUMMARY AND CONCLUSIONS

Breeding females of strain C_3H have a high incidence of spontaneous breast tumors at an average age of 8 to 9 months. Nonbreeding females have the same high incidence of tumors, but they appear at an average age of 11.5 months. It is concluded that pregnancy hastens the appearance of spontaneous mammary gland tumors in this colony of strain C_3H mice.

The preliminary findings of a foster nursing experiment in which strain C_3H mice were nursed by C57 black mice show that, up to the age of 13.5 months, the strain C_3H mice exhibit a tumor incidence of approximately 21.5 percent, which is much lower than the tumor incidence in breeding or nonbreeding mice of the same age. It is concluded that foster nursing by C57 black mice exerts a decided influence upon the occurrence of spontaneous mammary gland tumors in strain C_3H mice.

REFERENCES

(*1*) Andervont, H. B., and McEleney, W. J.: Pub. Health Rep., **52**: 772 (1937).
(*2*) Bittner, J. J.: Am. J. Cancer, **25**: 113 (1935).
(*3*) Bittner, J. J.: Am. J. Cancer, **30**: 530 (1937).
(*4*) Bittner, J. J., and Little, C. C.: J. Heredity, **28**: 117 (1937).
(*5*) Cori, C. F.: J. Exp. Med., **45**: 983 (1927).
(*6*) Korteweg, R., Genetica, **18**: 350 (1936).
(*7*) Lathrop, A. E. C., and Loeb, L.: Proc. Soc. Exp. Biol. and Med., **11**: 38 (1913).
(*8*) Lathrop, A. E. C., and Loeb, L.: J. Cancer Res., **1**: 1 (1916).
(*9*) Lynch, C. J.: J. Exp. Med., **42**: 829 (1925).
(*10*) Marsh, M. C.: J. Cancer Res., **13**: 313 (1929).

(*11*) Murray, W. S.: Am. J. Cancer, **20**: 573 (1934).
(*12*) Murray, W. S.: Am. J. Cancer, **30**: 517 (1937).
(*13*) Murray, W. S., and Little, C. C.: Genetics, **20**: 466 (1935).
(*14*) Murray, W. S., and Little, C. C.: Am. J. Cancer, **27**: 516 (1936).
(*15*) Slye, M.: J. Cancer Res., **1**: 109 (1916).
(*16*) Suntzeff, V., Burns, E. L., Moskop, M., and Loeb, L.: Am. J. Cancer, **27**: 229 (1936).

DEATHS DURING WEEK ENDED APR. 23, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Apr. 23, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	8, 661	9, 072
Average for 3 prior years	9, 131	
Total deaths, first 16 weeks of year	142, 023	100, 944
Deaths under 1 year of age	546	552
Average for 3 prior years	588	
Deaths under 1 year of age, first 16 weeks of year	8, 693	9, 951
Data from industrial insurance companies:		
Policies in force	69, 642, 337	69, 763, 872
Number of death claims	13, 910	14, 315
Death claims per 1,000 policies in force, annual rate	10. 4	10. 7
Death claims per 1,000 policies, first 16 weeks of year, annual rate	10. 0	11. 4

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (____) indicate that cases or deaths may have occurred although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Apr. 30, 1938, and May 1, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Apr. 30, 1938	Week ended May 1, 1937	Week ended Apr. 30, 1938	Week ended May 1, 1937	Week ended Apr. 30, 1938	Week ended May 1, 1937	Week ended Apr. 30, 1938	Week ended May 1, 1937
New England States:								
Maine	0	1	6	3	166	12	0	0
New Hampshire	0	0	____	____	13	85	0	0
Vermont	7	1	____	____	157	____	0	0
Massachusetts	4	4	____	____	386	067	2	4
Rhode Island	0	2	____	____	1	183	0	0
Connecticut	7	2	3	6	49	401	0	1
Middle Atlantic States:								
New York	30	47	[1] 15	[1] 13	4,234	1,281	8	13
New Jersey	20	16	7	8	1,211	2,392	1	8
Pennsylvania	33	32	____	____	3,009	1,113	2	13
East North Central States:								
Ohio	10	27	____	27	2,469	1,086	3	8
Indiana	19	9	17	14	979	332	2	0
Illinois [2]	35	27	18	41	2,455	282	1	7
Michigan [3]	8	13	____	3	3,930	160	4	0
Wisconsin	3	1	41	26	3,250	21	1	2
West North Central States:								
Minnesota	2	3	2	____	212	23	1	0
Iowa	2	3	____	6	268	15	0	1
Missouri	11	7	23	61	420	40	3	4
North Dakota	0	0	14	____	85	____	0	0
South Dakota	0	1	____	____	____	2	1	0
Nebraska	0	5	____	____	137	35	0	0
Kansas	4	9	6	24	605	42	0	1
South Atlantic States:								
Delaware	4	0	____	____	25	44	0	0
Maryland [2] [3]	4	6	4	4	107	509	0	4
District of Columbia	5	11	1	2	20	75	0	1
Virginia	11	5	____	____	423	634	0	9
West Virginia	10	14	20	50	517	123	4	5
North Carolina	5	10	14	31	2,223	321	2	13
South Carolina [4]	5	7	125	264	223	120	1	1
Georgia [4]	6	2	____	53	248	____	1	3
Florida	4	4	1	____	259	2	3	0

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Apr. 30, 1938, and May 1, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Apr. 30, 1938	Week ended May 1, 1937	Week ended Apr. 30, 1938	Week ended May 1, 1937	Week ended Apr 30, 1938	Week ended May 1, 1937	Week ended Apr. 30, 1938	Week ended May 1, 1937
East South Central States:								
Kentucky	20	10	5	16	405	551	2	15
Tennessee	3	4	30	37	296	44	2	6
Alabama [4]	10	9	39	93	619	12	6	13
Mississippi [3]	9	6	------	------	------	------	0	0
West South Central States:								
Arkansas	3	7	51	63	331	5	1	1
Louisiana [4]	12	15	11	63	17	2	0	0
Oklahoma [5]	1	9	53	41	127	62	0	0
Texas [4]	31	40	306	479	249	930	3	6
Mountain States:								
Montana	0	2	------	10	49	4	0	1
Idaho [2]	0	0	7	2	29	13	0	0
Wyoming [2]	2	0	------	------	42	25	0	2
Colorado [2]	9	5	------	------	356	19	0	2
New Mexico	22	3	------	------	84	74	0	0
Arizona	3	0	36	31	54	102	0	0
Utah [3]	0	0	------	------	334	23	0	0
Pacific States:								
Washington	1	0	------	------	39	53	0	0
Oregon [2]	1	2	27	29	52	11	2	1
California [4]	30	12	42	198	812	183	1	4
Total	406	393	924	1,698	32,006	12,176	57	149
First 17 weeks of year	9,308	8,477	39,027	266,608	555,979	127,959	1,416	2,857

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended Apr. 30, 1938	Week ended May 1, 1937	Week ended Apr. 30, 1938	Week ended May 1, 1937	Week ended Apr. 30, 1938	Week ended May 1, 1937	Week ended Apr. 30, 1938	Week ended May 1, 1937	Week ended Apr. 30, 1938
New England States:									
Maine	0	0	8	30	0	0	0	0	40
New Hampshire	0	0	6	4	0	0	1	0	------
Vermont	0	0	14	4	0	0	0	0	36
Massachusetts	0	0	332	238	0	0	2	2	120
Rhode Island	0	0	19	53	0	0	0	1	11
Connecticut	1	1	107	154	0	0	1	1	69
Middle Atlantic States:									
New York	0	0	675	985	0	0	5	9	535
New Jersey	0	0	126	246	0	0	2	3	211
Pennsylvania	0	0	270	747	0	0	3	5	165
East North Central States:									
Ohio	1	1	310	442	3	0	6	8	287
Indiana	0	2	109	177	87	10	9	0	28
Illinois [2]	2	1	487	725	19	25	5	4	126
Michigan [3]	0	0	412	765	5	16	6	5	336
Wisconsin	2	0	185	289	18	7	3	1	255
West North Central States:									
Minnesota	0	0	182	160	20	1	0	0	44
Iowa	0	0	166	230	36	80	2	2	28
Missouri	0	1	161	389	45	48	4	7	20
North Dakota	0	0	14	30	8	10	1	0	18
South Dakota	0	0	15	64	8	2	0	1	20
Nebraska	0	1	39	------	19	14	0	0	17
Kansas	0	0	105	326	13	18	1	1	183
South Atlantic States:									
Delaware	0	0	14	4	0	0	0	1	11
Maryland [2] [3]	0	0	75	40	0	0	1	1	61
District of Columbia	0	0	18	12	0	0	0	0	13
Virginia	1	2	17	17	0	0	6	9	81
West Virginia	1	0	26	55	1	0	8	2	50
North Carolina	0	0	23	37	1	2	2	3	437
South Carolina [4]	3	1	1	3	0	1	5	4	107
Georgia [4]	3	0	6	10	1	0	10	0	28
Florida	1	0	6	15	2	0	5	2	24

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended Apr. 30, 1938, and May 1, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended Apr. 30, 1938	Week ended May 1, 1937	Week ended Apr. 30, 1938	Week ended May 1, 1937	Week ended Apr. 30, 1938	Week ended May 1, 1937	Week ended Apr. 30, 1938	Week ended May 1, 1937	Week ended Apr. 30, 1938
East South Central States:									
Kentucky	1	0	39	40	12	0	3	6	139
Tennessee	0	0	28	11	3	0	2	2	42
Alabama [4]	1	0	6	6	23	2	2	0	62
Mississippi [3]	0	0	5	4	4	1	5	2	-------
West South Central States:									
Arkansas	1	0	6	7	4	7	5	1	43
Louisiana [4]	1	1	9	17	1	0	16	6	1
Oklahoma [5]	0	0	24	27	20	3	9	4	90
Texas [4]	0	1	92	139	4	14	8	21	327
Mountain States:									
Montana	0	0	15	84	3	69	2	1	34
Idaho [2]	0	0	9	12	16	5	1	2	10
Wyoming [2]	0	0	8	7	2	1	0	0	23
Colorado [2]	0	0	58	62	3	2	1	0	47
New Mexico	0	0	11	25	0	0	1	2	15
Arizona	0	0	8	13	6	0	1	1	65
Utah [3]	0	0	32	13	1	0	0	0	60
Pacific States:									
Washington	1	0	35	35	27	12	0	2	196
Oregon [2]	1	2	32	31	16	18	0	1	13
California [4]	0	2	207	170	34	20	7	6	643
Total	21	16	4,577	6,904	465	388	151	129	5,185
First 17 weeks of year	347	355	100,393	117,155	9,053	5,485	2,046	1,880	71,886

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[1] New York City only.
[2] Rocky Mountain spotted fever, week ended Apr. 30, 1938, 8 cases, as follows: Illinois, 1; Maryland, 1; Idaho, 1; Wyoming, 3; Colorado, 1; Oregon, 1.
[3] Period ended earlier than Saturday.
[4] Typhus fever, week ended Apr. 30, 1938, 16 cases, as follows: South Carolina, 1; Georgia, 5; Alabama, 5; Louisiana, 1; Texas, 3; California, 1.
[5] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
January 1938										
New Hampshire	0	1	10	-------	-------	-------	0	86	0	0
February 1938										
New Hampshire	0	0	10	-------	-------	-------	0	84	0	2
South Carolina	-------	113	2,522	289	1,659	60	2	28	0	8
March 1938										
Hawaii Territory	0	19	35	-------	124	-------	8	2	0	1
Kansas	2	23	53	-------	2,071	-------	0	761	73	2
Ohio	19	95	120	1	12,026	-------	4	1,650	62	16
Puerto Rico	0	38	55	2,708	36	7	0	-------	0	39
Virginia	12	67	681	7	2,393	5	5	173	0	11
Wisconsin	3	15	175	-------	20,505	-------	1	810	17	2

February 1938

South Carolina:	Cases
Chickenpox	206
Dengue	1
Diarrhea	230
Dysentery (amoebic)	1
Hookworm disease	91
Mumps	134
Ophthalmia neonatorum	10
Paratyphoid fever	2
Rabies in animals	35
Septic sore throat	10
Tetanus	1
Tularaemia	2
Typhus fever	5
Whooping cough	254

March 1938

	Cases
Anthrax:	
Puerto Rico	1
Chickenpox:	
Hawaii Territory	135
Kansas	797
Ohio	2,439
Puerto Rico	128
Virginia	412
Wisconsin	1,510
Conjunctivitis:	
Hawaii Territory (epidemic)	2
Diarrhea:	
Ohio (under 2 years; enteritis included)	7
Virginia	28
Dysentery:	
Hawaii Territory (amoebic)	1
Ohio (amoebic)	1
Puerto Rico	22
Virginia (amoebic)	1

March 1938—Continued

Dysentery—Continued.	Cases
Virginia (diarrhea included)	28
Encephalitis, epidemic or lethargic:	
Kansas	5
Ohio	1
Wisconsin	5
Filariasis:	
Puerto Rico	3
German measles:	
Kansas	7
Ohio	43
Wisconsin	69
Hookworm disease:	
Hawaii Territory	6
Impetigo contagiosa:	
Hawaii Territory	38
Lead poisoning:	
Ohio	2
Leprosy:	
Hawaii Territory	5
Puerto Rico	1
Mumps:	
Hawaii Territory	67
Kansas	1,222
Ohio	1,132
Puerto Rico	10
Virginia	202
Wisconsin	1.326
Ophthalmia neonatorum:	
Kansas	1
Ohio	53
Puerto Rico	1
Paratyphoid fever:	
Ohio	2
Puerperal septicemia:	
Ohio	6
Puerto Rico	6
Scabies:	
Kansas	19

March 1938—Continued

Septic sore throat:	Cases
Hawaii Territory	1
Kansas	5
Ohio	138
Virginia	80
Wisconsin	26
Tetanus:	
Hawaii Territory	2
Ohio	1
Puerto Rico	8
Tetanus, infantile:	
Puerto Rico	3
Trachoma:	
Hawaii Territory	2
Kansas	3
Trichinosis:	
Ohio	1
Tularaemia:	
Kansas	2
Ohio	2
Virginia	3
Wisconsin	8
Typhus fever:	
Hawaii Territory	2
Undulant fever:	
Kansas	6
Ohio	5
Wisconsin	9
Vincent's infection:	
Kansas	10
Puerto Rico	2
Whooping cough:	
Hawaii Territory	146
Kansas	524
Ohio	656
Puerto Rico	280
Virginia	342
Wisconsin	629
Yaws:	
Puerto Rico	2

PLAGUE INFECTION IN GROUND SQUIRRELS IN SANTA CRUZ COUNTY, CALIF.

Under date of April 28, 1938, Dr. W. M. Dickie, Director of Public Health of California, reported that plague infection had been proved, by animal inoculation, in one *beecheyi* squirrel from a ranch 4 miles east of Watsonville and in a pooled specimen of organs from five *beecheyi* squirrels from a ranch 6 miles east of Watsonville, Santa Cruz County, Calif. These specimens were submitted to the Hooper Foundation for Medical Research on April 13.

WEEKLY REPORTS FROM CITIES

City reports for week ended April 23, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	178	212	73	7,234	784	2,481	23	421	24	1,420	--------
Current week[1]	106	82	29	10,884	620	1,656	22	357	18	1,211	--------
Maine:											
Portland	1	------	0	10	1	0	0	0	0	3	19
New Hampshire:											
Concord	0	------	0	0	1	0	0	1	0	0	13
Nashua	0	------	0	0	0	0	0	0	0	0	7
Vermont:											
Barre	0	------	0	0	0	0	0	1	0	0	7
Burlington	0	------	0	13	0	0	0	0	0	0	10
Rutland	0	------	0	0	2	0	0	0	0	0	6
Massachusetts:											
Boston	0	------	0	186	32	97	0	3	0	9	238
Fall River	0	------	1	1	3	0	0	0	0	4	28
Springfield	0	------	0	17	0	2	0	2	0	9	40
Worcester	1	------	0	1	6	15	0	1	0	9	44
Rhode Island:											
Pawtucket	0	------	0	0	0	1	0	0	0	0	20
Providence	0	------	1	0	9	10	0	1	0	10	73
Connecticut:											
Brigdeport	0	------	0	5	3	12	0	1	1	0	35
Hartford	0	------	0	2	4	30	0	1	0	2	42
New Haven	0	3	0	1	3	0	0	0	0	5	41
New York:											
Buffalo	0	------	0	2	11	58	0	8	0	13	155
New York	27	9	4	2,706	112	345	0	87	0	235	1,554
Rochester	0	1	0	13	5	29	0	2	1	2	71
Syracuse	0	------	0	60	5	13	0	1	0	1	57
New Jersey:											
Camden	0	------	0	46	1	7	0	0	0	0	38
Newark	1	------	1	20	11	5	0	6	0	38	138
Trenton	0	------	0	3	2	5	0	1	0	0	49
Pennsylvania:											
Philadelphia	2	3	1	1,215	29	132	0	26	2	16	538
Pittsburgh	3	3	2	123	13	27	0	8	0	28	145
Reading	0	------	1	17	3	2	0	0	0	1	32
Scranton	0	------	--------	36	-------	10	0	-------	0	0	--------
Ohio:											
Cincinnati	1	------	1	8	6	17	0	7	1	4	120
Cleveland	0	19	1	340	14	60	0	9	1	56	180
Columbus	4	1	1	194	4	8	2	2	0	2	90
Toledo	1	------	0	121	10	5	0	2	0	29	65
Indiana:											
Anderson	0	------	0	187	1	0	0	0	0	4	9
Fort Wayne	1	------	0	37	4	3	0	0	0	2	27
Indianapolis	2	------	0	361	9	19	0	2	0	7	98
Muncie	0	------	0	0	2	0	0	0	0	0	7
South Bend	0	------	0	119	2	3	0	0	0	1	19
Terre Haute	0	------	0	24	0	0	4	0	0	0	11
Illinois:											
Alton	0	------	0	0	4	2	0	0	0	0	10
Chicago	12	8	1	980	34	241	0	81	0	57	659
Elgin	0	------	0	15	0	4	0	0	0	0	4
Moline	0	------	0	11	0	2	0	0	0	0	8
Springfield	0	------	0	90	3	1	1	0	0	0	22
Michigan:											
Detroit	10	------	0	1,256	16	112	0	14	1	80	247
Flint	0	------	0	134	2	37	0	0	0	26	27
Grand Rapids	0	------	0	135	2	14	1	1	0	4	36
Wisconsin:											
Kenosha	0	------	0	57	0	3	0	0	0	1	6
Madison	0	------	0	152	0	1	0	0	0	5	10
Milwaukee	0	------	0	225	5	11	0	6	0	52	104
Racine	0	------	0	345	1	7	0	0	0	31	21
Superior	0	------	0	7	0	4	0	0	0	2	8

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[1] Figures for Salt Lake City, Utah, and St. Joseph, Mo., estimated; reports not received.

City reports for week ended April 23, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	0	3	3	6	0	0	0	3	35
Minneapolis	0	------	0	230	6	9	9	0	0	3	108
St. Paul	1	------	0	4	8	16	0	0	0	3	67
Iowa.											
Cedar Rapids	0	------	------	8	------	1	0	------	0	3	------
Davenport	0	------	------	1	------	0	0	------	0	0	------
Des Moines	0	------	0	19	0	19	4	0	0	0	33
Sioux City	0	------	------	12	------	4	0	------	0	0	------
Waterloo	0	------	------	103	------	6	0	------	0	0	------
Missouri:											
Kansas City	2	------	1	42	12	16	0	3	0	1	97
St. Joseph	------	------	------	------	------	------	------	------	------	------	------
St. Louis	1	------	0	2	6	75	1	3	0	4	214
North Dakota:											
Fargo	0	------	0	1	2	1	0	0	0	3	16
Grand Forks	0	------	------	94	------	0	0	------	0	0	------
South Dakota:											
Aberdeen	0	------	------	0	------	0	0	------	0	6	------
Sioux Falls	0	------	0	0	0	0	1	0	0	0	10
Nebraska:											
Omaha	0	------	0	115	13	0	0	2	0	0	67
Kansas:											
Lawrence	0	------	0	59	0	0	0	0	0	1	3
Topeka	0	------	0	315	1	1	0	0	0	30	23
Wichita	0	------	0	33	4	2	0	0	0	4	30
Delaware:											
Wilmington	0	------	0	16	3	6	0	0	0	4	32
Maryland:											
Baltimore	0	3	1	20	23	33	0	13	0	33	223
Cumberland	0	------	0	5	1	2	0	0	0	0	19
Frederick	0	------	0	1	0	0	0	0	0	0	3
Dist. of Col.:											
Washington	4	------	0	23	15	27	0	8	0	13	163
Virginia:											
Lynchburg	1	------	0	1	4	1	0	1	0	2	16
Norfolk	0	------	0	28	6	7	0	3	0	1	36
Richmond	1	------	1	115	5	2	0	3	0	0	62
Roanoke	0	------	0	1	0	1	0	1	0	0	10
West Virginia:											
Charleston	0	------	0	0	0	2	0	0	0	0	10
Huntington	0	------	------	4	------	2	0	------	0	0	------
Wheeling	0	------	0	182	3	3	0	1	0	6	22
North Carolina:											
Gastonia	0	------	------	68	------	1	0	------	0	5	------
Raleigh	0	------	0	161	1	0	0	0	0	23	19
Wilmington	0	------	0	67	2	0	0	0	0	30	13
Winston Salem	0	------	0	5	2	1	0	0	0	38	16
South Carolina:											
Charleston	2	13	0	5	2	2	0	2	0	0	21
Florence	0	------	0	13	2	0	0	0	0	0	10
Georgia:											
Atlanta	0	2	1	19	10	1	0	7	0	9	88
Brunswick	0	------	0	11	0	0	0	0	0	0	4
Savannah	1	2	0	74	2	1	0	2	0	1	38
Florida:											
Miami	0	------	0	52	2	0	0	1	1	6	39
Tampa	0	2	1	33	1	1	0	2	1	0	21
Kentucky:											
Ashland	0	------	0	8	4	0	0	1	0	5	20
Covington	1	------	0	0	0	0	0	1	0	3	16
Lexington	0	------	0	2	2	1	0	2	0	0	21
Louisville	2	------	0	174	10	25	0	5	0	7	76
Tennessee:											
Knoxville	0	1	0	20	0	3	0	2	0	3	22
Memphis	0	------	0	20	3	3	0	10	0	2	70
Nashville	0	------	0	72	8	7	0	1	0	7	48
Alabama:											
Birmingham	0	2	0	54	4	2	0	3	1	0	71
Mobile	0	2	0	5	2	0	0	1	0	0	19
Montgomery	0	------	------	80	------	0	0	------	0	1	------
Arkansas:											
Fort Smith	0	------	------	3	------	0	0	------	1	0	------
Little Rock	0	------	0	2	7	1	0	3	0	2	10

City reports for week ended April 23, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	1	0	0	9
New Orleans	6	1	1	0	14	5	0	8	4	32	132
Shreveport	1	------	0	3	5	0	0	5	0	0	52
Oklahoma:											
Oklahoma City	0	------	0	0	2	4	0	1	0	0	29
Tulsa	0	------	------	101	------	2	1	------	0	11	------
Texas:											
Dallas	1	8	2	7	5	11	0	3	0	17	56
Fort Worth	0	------	0	5	1	2	0	2	0	5	30
Galveston	0	------	0	0	2	1	0	2	0	0	20
Houston	3	------	1	0	4	3	1	4	1	2	66
San Antonio	0	------	1	0	10	1	0	5	0	0	61
Montana:											
Billings	0	------	0	0	3	0	0	1	0	0	13
Great Falls	0	------	0	0	4	2	0	1	0	10	13
Helena	0	------	0	2	0	0	0	0	0	0	2
Missoula	0	------	0	0	1	0	0	1	0	0	6
Idaho:											
Boise	0	------	0	0	0	0	1	2	0	0	6
Colorado:											
Colorado Springs	0	------	0	0	1	1	0	2	0	1	11
Denver	5	------	1	131	7	13	0	4	0	7	105
Pueblo	0	------	0	6	0	3	1	0	0	12	7
New Mexico:											
Albuquerque	6	------	0	3	3	1	0	8	0	4	15
Utah:											
Salt Lake City	------	------	------	------	------	------	------	------	------	------	------
Washington:											
Seattle	0	------	2	4	8	5	0	3	0	56	105
Spokane	0	1	1	0	5	1	1	0	0	11	43
Tacoma	1	------	0	1	5	2	0	0	0	4	30
Oregon:											
Portland	1	------	0	20	9	15	2	2	0	1	82
Salem	0	1	------	1	------	0	0	------	0	0	------
California:											
Los Angeles	7	9	0	39	16	40	0	21	1	17	319
Sacramento	2	------	0	21	2	2	0	1	0	56	34
San Francisco	1	------	0	3	13	6	0	6	3	47	174

State and city	Meningococcus meningitis		Poliomyelitis cases	State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Rhode Island:				District of Columbia:			
Providence	1	0	0	Washington	2	0	0
New York:				Georgia:			
Buffalo	8	3	0	Atlanta	0	0	1
New York	1	0	0	Kentucky:			
Pennsylvania:				Lexington	1	0	0
Pittsburgh	0	0	1	Alabama:			
Scranton	1	0	0	Birmingham	8	2	0
Ohio:				Louisiana:			
Cincinnati	4	0	0	New Orleans	1	0	0
Indiana:				Shreveport	0	2	0
Indianapolis	1	1	0	Texas:			
Michigan:				Dallas	1	1	0
Detroit	4	0	0	Houston	1	0	0
Iowa:				Colorado:			
De Moines	1	0	0	Denver	8	1	0
Maryland:							
Baltimore	1	0	0				

Dengue.—Cases: Charleston, S. C., 1.

Encephalitis, epidemic or lethargic.—Cases: New York, 2; Philadelphia, 1; Chicago, 2.

Pellagra.—Cases: Lynchburg, 1; Charleston, S. C., 8; Atlanta, 2; Savannah, 5; Birmingham, 4; Dallas, 1; San Antonio, 1.

Typhus fever. Cases: New York, 1.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—2 weeks ended March 26, 1938.—During the 2 weeks ended March 26, 1938, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Nova Scotia [1]	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis			2	6	1				9
Chickenpox	14	25	551	462	95	41	10	252	1,450
Diphtheria	9	3	61	9	2	7			91
Dysentery			1	1				1	3
Erysipelas			24	3	7		2	8	44
Influenza	16		30	39	9			59	153
Measles	32	8	498	840	3	2	55	182	1,620
Mumps	31	11		308	252	1	26	60	689
Paratyphoid fever				1					1
Pneumonia	9			34		2		28	73
Poliomyelitis							1	1	2
Scarlet fever	38	6	260	213	30	93	91	92	823
Smallpox	2						8		10
Trachoma					1			3	4
Tuberculosis	8	17	100	107	22		4	23	281
Typhoid fever		5	50	1	4	2		1	63
Undulant fever			2	1					3
Whooping cough			168	209	81			101	559

NOTE.—No report was received from Prince Edward Island for the above period.

[1] For 2 weeks ended Mar. 30, 1938.

ESTONIA

Vital statistics—1937.—The following table shows the marriages, births, and deaths in Estonia for the year 1937:

Population	1,131,125	Number of births per 1,000 population	16
Number of marriages	9,585	Number of deaths	16,650
Number of births	18,190	Number of deaths per 1,000 population	15

SWEDEN

Notifiable diseases—March 1938.—During the month of March 1938, cases of certain notifiable diseases were reported in Sweden as follows:

Disease	Cases	Disease	Cases
Cerebrospinal meningitis	3	Poliomyelitis	[1] 61
Diphtheria	5	Scarlet fever	2,163
Dysentery	17	Syphilis	29
Epidemic encephalitis	2	Typhoid fever	2
Gonorrhea	816	Undulant fever	16
Paratyphoid fever	15	Weil's disease	2

[1] Includes 15 cases nonparalytic at time of notification.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for April 29, 1938, pages 685-700. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

India—Northwest Frontier Province—Dera-Ismail-Khan.—During the week ended April 30, 1938, 1 fatal case of cholera was reported in Dera-Ismail-Khan, Northwest Frontier Province, India.

Indochina (French).—During the week ended April 23, 1938, cholera was reported in French Indochina as follows: Annam Province, 76 cases; Tonkin Province, 425 cases; Hanoi, 39 cases.

Plague

On vessel—S. S. Ville de Tamatave.—On March 31, 1938, 1 case of plague was reported in a member of the crew of the S. S. *Ville de Tamatave* at Beirut, Syria.

United States—California.—A report of plague infection in ground squirrels in Santa Cruz County, Calif., appears on page 787 of this issue of the PUBLIC HEALTH REPORTS.

Smallpox

Mexico.—During the month of February 1938, smallpox was reported in Mexico as follows: Chiapas State, 1 case, 1 death; Mexico State, 1 case; Mexico, D. F., 4 cases, 2 deaths; Queretaro State, 4 cases, 3 deaths.

Typhus Fever

Mexico.—During the month of February 1938, typhus fever was reported in Mexico as follows: Mexico, D. F., 16 cases, 4 deaths; Queretaro, Queretaro State, 5 cases, 1 death; San Luis Potosi, San Luis Potosi State, 2 cases; Saltillo, Coahuila State, 1 death; Toluca, Mexico State, 7 cases, 2 deaths.

On vessel—S. S. Empress of Japan.—A case of typhus fever was reported on the S. S. *Empress of Japan* at Yokohama, Japan, on April 7, 1938.

Yellow Fever

Brazil.—Yellow fever has been reported in Brazil as follows: Minas Geraes State, February 17 to April 4, 1938, 9 deaths; Rio de Janeiro State, February 22 to April 3, 1938, 4 deaths; Santa Catharina State, March 28, 1938, 1 death.

Gold Coast—Keta.—On April 23, 1938, 1 fatal case of suspected yellow fever was reported in Keta, Gold Coast.

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UNITED STATES TREASURY DEPARTMENT

PUBLIC HEALTH REPORTS

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ISSUED WEEKLY

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Tests With a Single Dose of Precipitated Pertussis Vaccine
A Study of the Incubation Period in Cases of Undulant Fever
Maritime Deratization Activities in American Countries, 1936
Cancer Mortality in the United States, 1936 and Prior Years

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UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg Gen. ROBERT OLESEN, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PUBLIC HEALTH REPORTS

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PROPHYLACTIC VALUE OF A SINGLE DOSE OF PRECIPITATED PERTUSSIS VACCINE

(Preliminary Report)

By W. T. HARRISON, *Senior Surgeon, United States Public Health Service*, JOS. P. FRANKLIN, *Deputy State Health Officer, Maryland*, and JOSEPH A. BELL, *Passed Assistant Surgeon, United States Public Health Service*

It is well known that the precipitation of diphtheria toxoid by potassium aluminum sulfate or adsorption with aluminum hydroxide increases its antigenic efficiency many fold. This increase in immunizing effect is very probably due to the slowness with which the precipitate is absorbed (*1*). The sensitizing effect of proteins is also enhanced by the same treatment, as shown with precipitated ragweed pollen extract (*2*). Since the clinical course of pertussis infection in children indicates that immunity is not developed rapidly, it occurred to one of us (W. T. H.) that a vaccine characterized by prolonged action should offer greater chance for success than one in which absorption and excretion take place more rapidly. Accordingly, an alum precipitated pertussis vaccine was prepared as follows:

One liter of *H. pertussis* suspension prepared according to the Sauer technique (*3*) was obtained from a commerical manufacturer.[1] This suspension contained 10 billion organisms per cubic centimeter in 0.6 percent sodium chloride solution preserved with 0.5 percent phenol. Twenty-seven cubic centimeters of 10 percent sodium bicarbonate solution were added, followed by 250 cubic centimeters of 4 percent potassium aluminum sulfate solution, both having been filtered through a Berkfeld N candle. A heavy flocculent precipitate formed immediately, which was thoroughly shaken and placed at 10° C. After 5 hours the supernatant was decanted, replaced with 0.85 percent sterile sodium chloride solution, and returned to 10° C. overnight. The next morning the supernatant was again decanted and replaced to the original volume of one liter with 0.85 percent sodium chloride solution containing merthiolate 1:7500. The usual bulk sterility tests were done, the material was distributed into 10-cc vials, and the final containers were tested for sterility. No bacteria could be demonstrated in the supernatant; the precipitate, however, was heavily charged with bacterial bodies. Since no washing of the bacteria had been done at any stage of preparation of the suspension prior to precipitation, it seems reasonable to assume that products of bacterial metabolism may have been adsorbed to the precipitate.

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[1] Supplied through the courtesy of Parke, Davis and Company, Detroit, Michigan.

The precipitate causes no unusual reaction when injected into laboratory animals. The indurated area appears as promptly as when alum-precipitated diphtheria toxoid is injected, but subsides more rapidly. Early tests in children gave local and general reactions similar to those encountered with alum-precipitated toxoid in the same age groups.

Clinical trial was undertaken at Cumberland, Md., in children aged 11 to 34 months residing in two wards populated by families of more or less uniform economic status. The children were chosen alphabetically from births recorded as of 1934 and 1935. Those whose surnames began with B, D, F, H, and so on, were left unvaccinated, whereas those whose surnames began with A, C, E, G, and so on, were injected subcutaneously in the arm with 1 cubic centimeter of the vaccine suspension during the period November 10 to 21, 1936. The injection produced a small lump which persisted for a week or longer. The only other reactions noted by the parents and attributed to the injection were three instances of slight fever, one of which was accompanied by anorexia and a sore arm. Four public health nurses under the direction of one of us (J. P. F.) made repeated household visits to the families of all children throughout the ensuing year. They recorded pertinent information concerning pertussis in the family and established diagnoses with the aid of physicians who might be in attendance. No particular laboratory aids to diagnoses were utilized.

During the year an epidemic of pertussis occurred in Cumberland, the peak developing in June, approximately 7 months after the children had been vaccinated. At the end of 1 year, one of us (J. A. B.) revisited the families of the vaccinated and unvaccinated children to study and evaluate epidemiologically the effect of the single dose of vaccine.

Of the 241 children chosen for study, 50 were excluded from consideration on account of the following conditions: 2 children had history of pertussis prior to the beginning of study; 5 had received pertussis vaccine prior or subsequent to the beginning of study; 8 vaccinated and 5 unvaccinated children had surname initials designating them to the opposite group, unvaccinated and vaccinated respectively; 3 vaccinated and 2 unvaccinated children developed suspicious symptoms of pertussis but could not be classified definitely as cases or not cases; and 25 could not be located for observation after the forty-ninth week from the beginning of study. Of the 191 remaining children, 82 were in the vaccinated group and 109 in the unvaccinated group.

All known attributes other than vaccination which might possibly affect incidence of pertussis were distributed between the two groups in close proportion to the number of children in each group, with the following exceptions: males were preponderant in the unvaccinated group as compared with the vaccinated, and in this small study had an incidence of pertussis higher than females; also children with other susceptibles in the same household were in greater proportion in the unvaccinated group than in the vaccinated, and had an incidence of pertussis slightly higher than children with no such susceptibles in the household. The weight which should be given to the distribution of these attributes is questionable, particularly as regards sex. Considered both individually and collectively, these two disproportions in the distribution, measured strictly by the ratios of incidence shown in this study, would tend to bring about an incidence of pertussis in the vaccinated group lower than in the unvaccinated. The magnitude of such an influence, however, is insufficient in itself to account for the observed difference in incidence between the vaccinated and unvaccinated. The influence of the second mentioned attribute (the presence of other susceptibles in the same household), though on general grounds conceivably more important than sex, was in this study almost negligible.

During the year 10 cases of pertussis occurred in the 82 vaccinated children, an incidence of 12 percent. Seven were classified as mild cases, 2 moderate, and 1 severe. Twenty-one cases occurred in the 109 unvaccinated children, an incidence of 19 percent. Three of these were mild, 11 moderate, and 7 severe. Among the 191 children there were 18 "household exposures"; these were defined to include exposure to infection throughout the course of a case of pertussis occurring in another child of the same family under 10 years of age and living in the same household, but excluded such exposures where the observed child developed pertussis less than 7 days following onset of the primary household case. Eight such "household exposures" occurred in the vaccinated children and resulted in 3 cases; 10 such exposures occurred in the unvaccinated children and resulted in 8 cases.

SUMMARY AND CONCLUSIONS

A commercially prepared pertussis vaccine was precipitated with alum and the precipitate resuspended in saline solution to its original volume. One dose of 1 cc of this suspension was given to each of 82 children who, together with a similar group of 109 unvaccinated children, were subsequently observed for 1 year, to study the possible value of this vaccine in preventing or modifying cases of clinical pertussis.

The observation revealed that reactions following injection of the vaccine were negligible; that the incidence of clinical pertussis in the vaccinated group (12 percent) was lower than in the unvaccinated group (19 percent); and that of the total 31 cases occurring in both groups, the cases in the vaccinated group showed a preponderance of mild and a sparsity of severe attacks. These observed differences between the two groups are in no way convincing from a statistical standpoint and do not permit the conclusion that this vaccine had any prophylactic value for prevention or modification of clinical pertussis. At best, the differences suggest that the vaccine might have some prophylactic value, too little, however, to be demonstrated as real in the small group of this preliminary study.

In consideration of the small amount of antigen injected, the results are believed to justify further clinical trial on a larger scale, using a longer period of antigenic stimulation. Definite plans for such trial are in progress and contemplate the injection of two doses of vaccine separated by an appropriate time interval.

REFERENCES

(*1*) Harrison, W. T.: Some observations on the use of alum precipitated diphtheria toxoid. J. Am. Pub. Health Assoc., **25:** 298 (1935).

(*2*) Harrison, W. T.: Effect of alum precipitated ragweed pollen extract on guinea pigs. Pub. Health Rep., **49:** 462 (1934).

(*3*) Sauer, Louis: (A) Whooping cough—A study in immunization. J. Am. Med. Assoc., **100:** 239 (1933).

(B) Immunization with bacillus pertussis vaccine. J. Am. Med. Assoc., **101:** 1449 (1933).

(C) The preparation of bacillus pertussis vaccine for immunization. J. Am. Med. Assoc., **102:** 1471 (1934).

THE INCUBATION PERIOD IN UNDULANT FEVER

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There have been few opportunities to determine the incubation period in undulant fever; available estimates refer almost exclusively to *Brucella melitensis* infections. We have found no measure of this interval in naturally acquired infections due to *Br. abortus.* The study of cases occurring among persons temporarily absent from a large urban area served almost exclusively by pasteurized dairy products appeared promising. New York City has an ordinance requiring the pasteurization of all milk or cream sold commercially, except the certified product. This law has been enforced for more than a decade. It is estimated that the proportion of certified raw milk sold has been reduced from 2.5 percent in 1928 to less than 1 percent in 1937. Epidemiological inquiries would accurately identify the users of this "superior" brand. Butter sold commercially is prepared from pasteurized cream, as is the byproduct buttermilk. Cheese has not been incriminated in the spread of brucellosis. The residents of New York City therefore are almost entirely free from exposure to living *Brucellae* through the consumption of raw dairy products, and most certainly have no direct contact with the domestic animals which are the usual sources of these infections. One would expect that undulant fever, if it does involve such individuals, would be acquired only during intervals of absence from the city.

Excluding clinically questionable infections and those with diagnoses unconfirmed by laboratory examinations, a total of 89 cases of this infection has been reported to the New York City Department of Health from the time that the first case was reported in 1928 to the end of 1937. There were 32 cases reported in 1936 and 1937 during which time adequate means for its detection in the laboratory have been routinely applied. No records were found for the three cases reported in 1928, and seven early reports were too incomplete to permit satisfactory analysis. Twenty-four of the patients were nonresidents who came to the city when ill for hospitalization or treatment. We have also omitted from further analyses three chronic or complicated infections, since in these cases there is greater uncertainty as to the true chronological relationships.

There remain 52 cases involving city residents. Ten of these are known to have been continuously in the city for several months preceding onset. Two of these patients were packing plant employees, and we believe that they acquired the disease in their occupational pursuit. Another was a painter in a pasteurizing plant who intentionally drank large quantities of the raw milk. A fourth was a user of certified raw milk. Two of the early cases gave a history of obtaining unidentified "loose" milk at a price below that currently charged for reliable brands. We believe it is reasonable to suspect that they had been obtaining a "bootleg" product not coming within the requirements of the milk laws and regulations and not pasteurized. It was affirmed in four cases that the patient had not been away from the city and had consumed only pasteurized products from acceptable sources. Two of these were children 8 and 10 years of age; one of the adults was a janitor, the other a salesman. The recent use of the phosphatase reaction has demonstrated that defects in pasteurization do occur. Possibly these cases are further evidence of this. However, during 1936 and 1937, when records on the disease were collected with greater care, no unexplained acute infection was found. It is noteworthy that in a population of over 7 million only four such cases should be discovered within a period of a full decade. This stands in marked contrast to the experience in rural and small urban centers served largely by raw dairy products.

Eighteen of the forty-two individuals who had been out of town within a possible incubation period, had had repeated business or week-end trips, and most of them gave a history of a corresponding intermittent use of raw dairy products. There had been only one trip in each of 24 cases, and this trip was preceded and followed by several months continuous residence in the city. The onset occurred in three cases prior to return after periods of 1, 6, and 8 weeks away from the city, and in four cases the individuals remained away for 3 months or more. Thus there remain 17 cases to provide evidence relative to the incubation period.

Characteristically the onset in undulant fever is insidious, and particularly so in infections due to *Brucella abortus.* The chief difficulty in computing an incubation period was the uncertainty in the patient's own mind as to the actual date on which his illness began. An extreme example of this problem is illustrated by one patient who was out of the city during the first week in June. He spent his vacation on a farm where he drank raw milk freely. After his return he remained quite well until the middle of July. He then began to note an unusual fatigue. About 1 month later a nonlocalized abdominal discomfort appeared. These two complaints continued but did not cause physical incapacity. However, on November 15 he was taken rather suddenly more severely ill with fever, chills, and sweats. He was admitted to a hospital on December 1, where his condition was diagnosed. A prodromal period as long as this is unusual, but commonly it may be measured in weeks rather than in days. The incubation period, therefore, will vary, depending on the definition of the onset. For this reason we have sought to ascertain from the records the date of the earliest symptoms and also the onset of those of such severity that rest in bed was sought, or the counsel of a physician obtained. The differentiation was possible in 10 cases; in the others we were forced to assume that the dates coincided.

The relevant observations concerning these cases are summarized in table 1. Maximum and minimum incubation periods have been calculated, placing the exposure dates respectively at the beginning and at the end of the vacation periods. Means are also indicated, dating these from the onset of the earliest symptoms and from the beginning of the severer ones. The median of the mean incubation periods computed to the onset of earliest symptoms in this small series is 10 weeks; to the onset of severer symptoms 13 weeks. Considering the minimum period and including the three cases with onset prior to return to the city, there was a wide and rather even distribution of from 1 to 16 weeks, with the median at 6.5 weeks. There were five

TABLE 1.—*The incubation period in 17 cases of undulant fever*

Case	Date of report	Sex	Age	Occupation	Dates out of city	Onset		Incubation period in weeks			
						Earliest symptoms	Severe symptoms	To earliest symptoms			To severe symptoms, mean
								Maximum	Minimum	Mean	
1—I. M	Jan. 1932	M	23	Clerk	July 2–Sept. 15, 1931	Nov. 4	Nov. 10	18	8	13	14
2—B. S	Feb. 1932	F	40	Housewife	Aug. 19–Sept. 1, 1931	Dec. 25	Jan. 15	18	16	17	20
3—B. B	Dec. 1932	F	56	do	May 15–Aug. 1, 1931	Sept. 12	Sept. 12	17	6	11.5	11.5
4—A. B	Nov. 1933	F	54	do	July 23–Aug. 15, 1933	Oct. 13	Oct. 20	12	8	10	11
5—L. T	Feb. 1936	F	55	do	Aug. 7–Sept. 20, 1935	Dec. 15	Dec. 15	18	12	15	15
6—J. H	Mar. 1936	M	29	Lawyer	Aug. 28–Sept. 4, 1936	Dec. 10	Dec. 10	15	14	14.5	14.5
7—R. S	Sept. 1936	F	40	Housewife	Aug. 2–Aug. 9, 1936	Aug. 25	Aug. 25	3	3	2.5	2.5
8—W. B	Nov. 1936	M	45	Truck driver, dept. san	July 15–Aug. 12, 1936	Oct. 22	Oct. 22	14	10	12	12
9—J. B	do	M	26	Bookkeeper	July 1–Aug. 8, 1936	Sept. 20	"Later"	12	6	9	(?)
10—W. M	Dec. 1936	M	45	Court reporter	Aug. 10–Sept. 10, 1937	Oct. 1	Nov. 11	7	3	5	11
11—H. P	do	M	26	Clerk	June 1–June 8, 1936	July 15	Nov. 15	6	5	5	23
12—J. N	Jan. 1937	M	21	Student	Aug. 1–Aug. 23, 1937	Sept. 30	Nov. 19	9	5	7	14.5
13—J. H	Mar. 1937	M	47	Fur salesman	July 11–July 25, 1937	Oct. 30	Dec. 15	16	14	15	22
14—E. K	Apr. 1937	F	41	Housewife	Aug. 1–Aug. 25, 1937	Mar. 8	Mar. 8	31	28	29.5	29.5
15—H. B	Sept. 1937	M	28	Advertising	July 10–July 31, 1937	Aug. 19	Sept. 11	6	3	4.5	7.5
16—L. M	Oct. 1937	F	55	Housewife	July 2–July 8, 1937	July 23	Sept. 13	3	2	2.5	10
17—M. B	do	F	51	Clerk	Aug. 8–Aug. 15, 1937	Oct. 3	Oct. 3	8	7	7.5	7.5

cases in which the calculated minimum incubation periods fall within the first month, nine within the second, two within the third, three within the fourth, and one within the seventh. When estimated to the onset of the severer symptoms, there was one of the 17 cases in which the minimum interval was less than 1 month; in only four was it less than 2 months. Thus the evidence points to a much more prolonged incubation period than has generally been supposed.

The validity of any conclusion in this study rests upon the question whether the infection in these cases was acquired within the city or actually during periods while the patients were outside. In all the cases the epidemiological evidence is clear as to the exclusive use of pasteurized dairy products in New York City and freedom from hazardous occupational contacts. All the patients had been out of the city and most of them knew that they had used raw milk; the others had been in places beyond easy reach of pasteurized products and presumably had been served raw milk. Further, the duration of the out-of-town visit was in no case less than 6 days and in four cases it was over 1 month. There was therefore a substantial period of known or probable exposure followed by one with almost certainly no exposure. The probability of acquiring the infecting organisms during the later rather than the earlier interval seems clearly to be very remote.

The seasonal distribution of cases in New York City residents provides further evidence as to the probable origin of these infections. If the trips out of the city were unrelated events, the seasonal distribution of the New York City cases would probably conform to that noted elsewhere, that is, they would be scattered generally throughout the year but with some increase during the spring and summer. The marked variation from this is indicated in table 2. There was a concentration in the fall months of the dates of onset—34 of the 46 patients becoming ill in the 5 months, August to December, inclusive. These cases gradually became diagnosed and reported. All but 7 of the 46 cases were reported in the months October to March. This reversal in the usual seasonal distribution differentiates these cases from those among persons more or less continuously exposed. The observations are adequately explained by the assumption that these are infections acquired chiefly during the summer months, when people "go to the country," and become manifest after prolonged incubation periods.

The variety of organisms involved in these cases is indicated only by the epidemiological findings. With two exceptions, these were infections acquired in vacation territories in the northeast, localities where *Brucella* infection of animals is rare except in cattle. Further, these visitors to the country would have no hazardous exposures to swine even if the *Br. suis* infection did exist. Goats and *Br. melitensis* infection are even rarer. Despite the lack of bacteriological confirmation, the conclusion appears warranted that the cases under consideration are *Br. abortus* (bovine) infections.

TABLE 2.—*Seasonal distribution of undulant fever among New York City residents* [1]

Quarter	By month of report			By month of onset		
	New York City		United States [2]	New York City		Iowa [3]
	Number	Percent	Percent	Number	Percent	Percent
January-March	16	34.8	18.0	6	13.0	23.7
April-June	4	8.7	26.9	3	6.5	28.3
July-September	3	6.5	30.3	13	28.3	28.6
October-December	23	50.0	24.8	24	52.2	19.4
Total	46	100.0	100.0	46	100.0	100.0

[1] In 6 cases 1 or both of these dates were not stated.
[2] Based on 10,492 cases reported to Public Health Service, 1929-35.
[3] Based on 1,067 cases studied in Iowa, 1928-35.

DISCUSSION

Heretofore the evidence concerning the incubation period in undulant fever has been gathered chiefly in the Mediterranean region and in experimental laboratories. It was noted in the garrisons in Malta that soldiers recently arrived developed the fever as early as the latter part of the first week of residence there. Thus minimum incubation periods could be measured. Average intervals could not be obtained in the same situation; nevertheless, the usual incubation period has been variously stated as ranging about 14 days with extreme limits of 3 to 20 days or possibly more. It was recognized by some and disputed by others that a more prolonged period might occur.

The famous case of the steamship *Joshua Nicholson,* which sailed with a cargo of 65 goats from Malta on August 19, 1905, gives striking evidence relative to the time relationships of beginning exposure and onset of symptoms (*1*). During the voyage of this vessel to Antwerp the goats' milk was used freely by 8 of the 12 men who manned the vessel. All of these 8 men became ill between 18 and 34 days after the loading at Malta, and 4 to 20 days after unloading at Antwerp. More recently, Rainsford (*2*) has presented evidence as to the minimum incubation periods in three cases contracted at Malta These periods were 42 days, 20 days, and 39 days.

Experimental inoculation of human volunteers with *Brucellae* has been carried out by Morales-Otero (*3*). Exposures were made by feeding, and by applications to the normal and abraded skin. Nine out of forty volunteers developed clinical evidence of undulant fever, and a tenth possibly suffered from an atypical infection. The incubation periods measured from the earliest symptoms are indicated in table 3. The volunteers were observed in hospital, hence the calculated incubation periods indicate the interval from exposure to the beginning of the prodrome. There was only one *Br. abortus* infection following ingestion of massive doses of the organism. The recorded incubation period was 10 to 17 days, but to earliest symptoms which would ordinarily be given attention the interval was 28 to 35 days.

TABLE 3.—*The incubation period in experimentally induced undulant fever*

[From the study of P. Morales-Otero (*8*)]

Case No.	Variety of *Brucella*	Nature of exposure	Date of exposure	Date of earliest symptoms	Incubation period in days
II	*abortus*	Abraded skin	Feb. 10	Feb. 20	10
VII	*suis*	Ingestion	July 23 and Aug. 9	Aug. 27	17 or 34
VIII	*suis*	Abraded skin	Feb. 10	Feb. 20	10
XVII	*abortus*	do	do	Feb. 20	20
XIX	*melitensis*	Ingestion	Feb. 17	Feb. 23	[1] 10
XX	*melitensis*	Abraded skin	Feb. 10	Feb. 26	16
XXIII	*suis*	do	do	Feb. 21	11
XXXVIII	*suis*	Ingestion	Daily from Aug. 26 to Aug. 30	Sept. 7	8–12
XL	*abortus*	do	Daily from May 1 to May 7	May 17	10–17

[1] The period here was possibly 6 days, but it was stated in the case report that the patient continued well until 10 days after inoculation.

There is evidence, therefore, that the incubation period in undulant fever varies widely. The disease may develop rapidly following exposure to the more virulent *Br. melitensis*. The cases reported here indicate, however, that following the ingestion of the less virulent *Br. abortus*, illness may manifest itself only after relatively prolonged periods. Sufficient data are not available to reveal the incubation period in *Br. suis* infection or following skin inoculation with any variety, but limited information suggests that these periods may be short. It is clear, however, that in interpreting findings and in accumulating data, due consideration must be given to the variety of *Brucella* involved, the method of inoculation, and dosage of infecting organisms. It is also evident that we must explore sources quite remote in time from the reported date of onset if we are dealing with undulant fever presumably acquired through the use of raw cow's milk.

SUMMARY

Residents of the city of New York, with few exceptions, are exposed to brucellosis only when visiting beyond the metropolitan area.

Seventeen cases are presented in which the individuals are believed to have been exposed to this infection through the use of raw cow's milk consumed during single out-of-town visits of 6 days to 11 weeks' duration.

The incubation periods were found to vary widely—from 1 week to not less than 4 months, with average intervals much more prolonged than those for *Br. melitensis* infections as ordinarily stated in the literature.

A method is indicated of assembling the data needed to provide more precise knowledge concerning the incubation period in naturally acquired *Br. abortus* infections.

It is suggested that the wide range in incubation periods in undulant fever is accounted for in part by the variations in virulence of the three varieties of *Brucella*, by the different modes of inoculation, and probably by variation in the dosage of infecting organisms.

REFERENCES

(*1*) Report of the British Mediterranean Fever Commission, 1905–07; part VII, p. 107.

(*2*) Rainsford, S. G.: Undulant fever, with special reference to cases seen in Malta, J. Royal Nav. Med. Serv., 21:81–105 (April 1935).

(*3*) Morales-Otero, P.: Brucella abortus in Porto Rico. Porto Rico J. Pub. Health and Trop. Med., 6:3–88 (September 1930).

DERATIZATION ACTIVITIES IN PORTS AND ON SHIPS IN AMERICAN COUNTRIES DURING 1936[1]

From information prepared by the Office International d'Hygiene publique, with comments by C. L. Williams, *Assistant Surgeon General*, and B. J. Lloyd, *Assistant to the Director, Pan American Sanitary Bureau; Medical Director (Retired), United States Public Health Service*

INTRODUCTION

Since 1931 the International Office of Public Health, in fulfillment of articles 6, 25, and 28 of the International Sanitary Convention signed at Paris June 21, 1926, has published each year a "Summary of reports received concerning the destruction of rats in ports and on board ships, the deratization of ships, and the issuing of certificates of deratization and of exemption from deratization."

The sixth of these summaries appeared recently. It contains the reports for the year 1936 and furnishes information on more than 100 countries or colonies scattered throughout the world. It has been considered of interest to extract from the summary the data referring to the American continent.

The American countries for which information is given are as follows: Antigua (Leeward Islands), Argentina, Bahamas, Barbados, Bermuda, Brazil, British Guiana, Canada, Chile, Colombia, Curaçao, Ecuador, Salvador, Falkland Islands, French Guiana, Grenada (Windward Islands), Guadeloupe, Haiti, Hawaiian Islands, Jamaica, Martinique, Panama (Canal Zone), Paraguay, Peru, Philippine Islands, Puerto Rico, St. Pierre et Miquelon, Saint Vincent, Saint Lucia,

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[1] Translation. This article will appear, in French, in the Boletín de la Oficina Sanitaria Panamericana for June 1938, issued by the Pan American Sanitary Bureau, Washington, D. C.

Trinidad, United States, Uruguay, Venezuela and Virgin Islands. In all, data are given for 34 countries or colonies, including the noncontiguous colonies under American protectorate or control—the Territory of Hawaii and the Philippine Islands.

Five other colonies or countries of America not included in the present summary—the Republics of Costa Rica, Cuba, Guatemala, Mexico, and the colony of British Honduras—have, on former occasions in the last six years, furnished information to the International Office in regard to the campaign against rats. Costa Rica, in 1932, and Guatemala and British Honduras, in 1934, reported that, as plague had not been present in their territories for a considerable time, no campaign of deratization was being carried out, and no service of deratization existed in their ports.

The report from Cuba for 1936 arrived too late to be included, but the data may be summarized as follows: In 1936, 53 ships were deratized, but because the boats were often fumigated with full holds, or left the port soon after the process, investigations could not be carried out except on 9 ships, in which 47 rats were discovered; 53 certificates of fumigation and 48 of exemption were given. Two ships were deratized before unloading, and numerous insects and some rats were found. No case of rat plague was reported.

The latest reports received from Mexico are for 1934. In the 9 principal ports of the country, 107,328 rats were captured and none was found to be plague-infected; 253 ships were fumigated with hydrocyanic acid gas in the 9 ports, and in 3 of the ports 357 rats were killed by fumigation aboard ship; none was found infected. During the year, 427 certificates of deratization were issued, 253 following the international form, and the remainder no doubt on a local form.[2]

ON SHORE DERATIZATION IN THE PORTS

No systematic deratization is carried out in Antigua, Curaçao, Falkland Islands (Port Stanley), Guadeloupe (Pointe-a-Pitre), British Guiana (Georgetown), French Guiana, Saint Pierre et Miquelon, or Salvador; consequently no data were available regarding the number of rats, and species, destroyed in these countries.

In the 13 principal ports of Argentina, 69,605 rats were destroyed, as compared with 72,291 in 1935, and 41,921 rats were examined, as compared with 32,092 in 1935. Seven rats captured in Buenos Aires in 1936 were found to be plague-infected, while 17 were so found in 1935 (15 in Santa Fe and 2 in Bahia Blanca). As to species, *Epimys* [*Mus*] *decumanus* [*R. norvegicus*(?)] was most numerous in Buenos Aires (8,834 as against 4,175 *R. rattus* and 3,153 *R. alexandrinus*); while in Rosario, *alexandrinus* was first (1,995 as compared with 1,305 *decumanus* and 933 *rattus*). In Santa Fe, Bahia Blanca, and La Plata, almost all the rats were *decumanus*.

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[2] In 1936, 169,705 rats were captured in the ports in anti-plague work. (Pan American Sanitary Bureau.)

In the Bahamas, 10 rats were destroyed at Nassau; 2,485 (*norvegicus* and *rattus*) at Bridgetown, Barbados, and in the Bermudas, 1,650. No plague-infected rats were found.

The only data for Brazil covering the entire year 1936 are for Rio de Janeiro, but since September 1, 1936, São Salvador (Bahia), Recife, and Fortaleza[3] have systematic reports of deratization, so that beginning with 1937 complete information will be available for six ports of this important country. In the port of Rio de Janeiro, 301 rats were destroyed in 1936, as compared with 348 in 1935; while in the city, 64,086 rats were killed in 1936. During the last four months of the year, 2,872 rats were destroyed in the city of São Salvador, 5,165 in Recife, and 3,729 in Fortaleza. No plague rats were found.

In the ports of Canada the port commissioners and private parties undertake the destruction of rats. Although port supervision is in the hands of the quarantine agents of the Federal service, statistics are not available as to the rats destroyed and examined.

In the four principal ports of Chile, 62,245 rats were destroyed in 1936; practically all of them were examined, and no plague infection was found. In the Republic of Colombia, during the second half of 1936, 18,118 rats were destroyed. This country reports that, because of the danger from continuous recrudescences of plague in a neighboring country, the National Department of Health is planning to organize soon, in the ports of the Republic, a campaign of deratization based on the most modern principles.

In the Republic of Ecuador, 58,032 rats were examined in Guayaquil, of which 50 were found to be plague-infected.

In the United States, 126,302 rats were destroyed in the 7 ports of New York, New Orleans, Mobile, Los Angeles, Oakland, San Francisco, and Seattle; 87,121 were examined and none was found plague-infected. In Hawaii, 216,623 rats were destroyed, nearly all were examined, and 26 were found plague-infected (23 plague rats on the Island of Hawaii and 3 on Maui). In the Philippines, 52,076 rats were captured at Manila, and in Puerto Rico, 5,533 rats at San Juan.

On the Island of Grenada (Windward Islands), 2,647 rats were destroyed in the port of St. George, and in Haiti, 410 rats captured at Port-au-Prince were examined. In Kingston, Jamaica, 1,413 rats, belonging to the species *R. norvegicus* and *rattus*, were destroyed. At Fort-de-France (Martinique), 13,353 rats were trapped. None was found plague-infected, which is not surprising, as it has been a long time since plague disappeared from the Antilles.

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[3] Maceio and Santos are also sending reports on rat work (Pan American Sanitary Bureau.)

In Paraguay, 4,411 rats were destroyed in the city of Asuncion; in Peru, in the six principal ports, 21,007 rats were killed, of which 28 were found plague-infected (19 from Callao, 6 from Salaverry, 3 from Pacasmayo).

In the Windward Islands, 434 rats were destroyed at Kingstown (St. Vincent), and 4,101 (*R. rattus*) at Port-Castries (St. Lucia). In Trinidad, 10,892 rats were captured (8,252 *decumanus* and 2,640 *rattus*).

In Uruguay, 628 rats were destroyed in the port of Montevideo; and in Venezuela, 862 rats were examined in the three large ports and 7,106 at Caracas. No plague-infected rats were found.

SHIPS DERATIZED

No ships were deratized in the ports of the following American countries: Antigua, Bermuda, Falkland Islands, Grenada, Guadeloupe, French Guiana, Haiti, St. Pierre et Miquelon, St. Vincent, St. Lucia, Salvador. No information on this matter was received from Colombia, Ecuador, and Venezuela.

TABLE 1.—*Number of vessels deratized and procedure employed, 1935 and 1936*

Country	Number of vessels deratized		Procedure employed, 1936	
	1936	1935	Sulfurous anhydride or sulfur	Hydrocyanic acid gas
Argentina	3,968	3,854	1,369	2,599
Bahama Islands	5	2	5	----------
Barbados	67	66	67	----------
Brazil (Rio de Janeiro)	220	221	159	61
British Guiana	1	----------	----------	----------
Canada [1]	121	93	4	117
Chile	66	74	2	64
Cuba	53	130	----------	----------
Curaçao	17	18	----------	17
Hawaiian Islands [2]	12	18	----------	12
Jamaica	27	35	----------	27
Martinique	4	8	4	----------
Panama Canal Zone [2]	67	48	----------	67
Peru	118	113	10	108
Philippine Islands [2]	345	360	288	57
Puerto Rico [2]	6	14	----------	6
Trinidad	4	----------	4	----------
United States [2]	810	726	19	791
Uruguay	5	----------	----------	----------
Virgin Islands [2]	11	21	11	----------
Total	5,927	5,800	1,942	3,926

[1] Apr. 1, 1936–Mar. 31, 1937, and Apr. 1, 1935–Mar. 31, 1936.
[2] July 1, 1935–June 30, 1936, and July 1, 1934–June 30, 1935.

As shown in table 1, hydrocyanic acid is used throughout America twice as much as sulfur and its derivatives. It is generally preferred; and, of late, in some countries (Canal Zone, Hawaii, Puerto Rico, Jamaica) it is even the only method used; whereas in the old European possessions in the Antilles (Barbados, Martinique, Trinidad, and the Virgin Islands) sulfur is exclusively used. It should be noted that in the Philippine Islands, as in the Orient and Far East, sulfur deratization is still in favor.

DERATIZATION ON BOARD SHIP

None of the rats destroyed on board ship through fumigation in American ports was found plague-infected. In Argentina, 5,890 rats were destroyed by the fumigation of ships in 1936, as compared with 6,830 in 1935. In 1936, 375 of these rats were killed before fumigation, and 5,517 were found dead after fumigation. In the Bahama Islands, 8 rats were destroyed aboard ship by fumigation; in Barbados, 81; Brazil (Rio de Janeiro), 685; Canada, 708 rats and 246 mice; Chile, 1,211 rats; Curaçao, 120; United States, 4,562; Canal Zone, 198; Philippine Islands, 1,081; Puerto Rico, 23; Virgin Islands, 2; Jamaica, 139; Martinique, 136; Peru (Callao), 552

CERTIFICATES OF DERATIZATION AND EXEMPTION FROM DERATIZATION

Under the terms of article 28 of the International Sanitary Convention of 1926, all ships, except those in the national coasting trade, should be periodically deratized or else maintained permanently in such condition that the rat population is at a minimum. They will receive, in the former case, certificates of deratization, and in the latter, certificates of exemption from deratization.

Certificates of deratization or of exemption are issued exclusively by the health authorities of the ports which the respective Governments have reported to the Office International d'Hygiène publique as having the equipment and personnel necessary for the deratization of ships.[4]

The duration of the validity of these certificates is 6 months; sometimes, however, an additional month is allowed for free ships to regain their home ports.

In 1936 no certificate, either of deratization or of exemption, was issued in the following countries:[5] Antigua, Barbados, Falkland Islands, Grenada, Guadeloupe, French Guiana, Haiti, St. Pierre et Miquelon, St. Vincent, St. Lucia, Salvador, Uruguay. In the last-named country, although 5 ships were deratized at Montevideo, no certificate was issued, the port of Montevideo not being qualified to issue certificates. No information on this subject was received from Colombia, Ecuador, Paraguay, and Venezuela. In the other American countries [6] certificates were issued as follows:

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[4] Each year the Office International d'Hygiène publique publishes the list to date of ports which the participating Governments (and even the nonparticipating, in certain useful cases) have designated as qualified for such purpose. The latest list, No. 10, gives all such data received up to November 15, 1937.

[5] To this list must be added Costa Rica, Guatemala, and British Honduras, which have no deratization service.

TABLE 2.—*Numbers of certificates of deratization and of exemption issued by certain American countries in 1936*

Country	Number of certificates issued	
	Deratization	Exemption
Argentina	3,968	42
Bahamas	5	----------
Bermuda	----------	1
Brazil (Rio de Janeiro)	220	58
British Guiana	1	----------
Canada [1] [2]	121	266
Chile	66	41
Curaçao	16	44
Hawaiian Islands [3]	12	3
Jamaica	27	----------
Martinique	4	----------
Panama Canal Zone [3]	67	7
Peru	118	----------
Philippine Islands [3]	345	14
Puerto Rico [3]	6	25
Trinidad	2	2
United States [3]	810	1,802
Virgin Islands [3]	11	4
Total, 18 American countries	5,799	2,309
Total, 50 other countries in summary	9,434	12.929
Total for the 68 countries in summary	15,233	15,238

[1] In Canada 76 extensions of validity were accorded to certificates after inspection of the ships concerned.
[2] Apr. 1, 1936–Mar. 31, 1937.
[3] July 1, 1935–June 30, 1936.

As may be seen from table 2, there were issued in 1936, in American countries, almost three certificates of deratization for each exemption certificate, while in the 68 countries throughout the world covered in this research there were, during the same year, practically the same number of exempted and deratized ships. At first sight it would seem that the rat index of ships traveling in American waters is three times higher than the average index for world ships, and four times as high as the index for 50 non-American countries. It is seen that this conclusion is not justified, however, if one sets aside the figures for the Argentine Republic where, undoubtedly because of the nature of the cargoes (cereals) loaded there for Europe, the merchant fleet must comprise a high number of old boats in which the rat population multiplies easily. This is, at least, the only clear reason coming to mind to explain why this country has such an unusual number of deratizations (3,968) as compared with exemptions (42). Aside from Argentina, it will be seen that the United States issues approximately twice as many certificates of exemption (1,802) as of deratization (810); the same condition obtains in Canada (121 deratizations per 266 exemptions), whereas in the Asiatic American possessions (the Hawaiian and Philippine Islands), the number of deratizations greatly exceeds the number of exemptions, 12 to 3 in Hawaii and 345 to 14 in the Philippines. These figures conform to those of other countries in those regions.

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[6] The numbers of certificates issued in Cuba in 1936 were 53 of deratization and 48 of exemption; and in Mexico in 1934, 427 certificates of deratization were issued.

SHIPS DERATIZED BEFORE UNLOADING CARGO

In wording the articles concerning the deratization of ships in the case of plague, the International Sanitary Conference of 1926 felt that a satisfactory result would seldom be obtained unless the operation should be carried on after unloading, but cases have been reported to the Permanent Committee of the International Office in which the unloading of ships carrying plague rats, especially when the cargo consists of grain, proves difficult to carry out without risk to the personnel employed in unloading and without real danger of infected rats reaching the land. Consequently the quarantine commission of the permanent committee has decided that the fumigation of a ship before, or during, the unloading may be in certain cases useful and even necessary to public health. However, in principle, a fumigation carried out before unloading should not be used as the basis for the issuing of a certificate of deratization unless a careful inspection of the ship after unloading shows that the results were entirely satisfactory. Otherwise a second deratization should be carried out with empty holds.

In America, only two countries during the year in question reported deratizations of ships before unloading. They are Canada (April 1, 1936–March 31, 1937) and the United States (July 1, 1935–June 30, 1936).[7] In Canada 31 boats were fumigated before unloading (of which 14 at Halifax, 7 at Saint John, 8 at Vancouver). Following fumigation, in all, 26 rats were found (24 at Vancouver). In the United States, 403 ships were fumigated before unloading (of which 14 at Angel Island; 27 at Baltimore; 56 at Boston; 22 at Jacksonville; 67 at Los Angeles; 29 at Marcus Hook; 31 at New Orleans; and 139 at New York). In all, 2,377 rats were found (1,030 in the 139 ships at New York; 468 in the 31 at New Orleans; 274 in the 29 at Marcus Hook; 257 in the 67 at Los Angeles; 170 in the 27 at Baltimore; 74 in the 56 at Boston; 58 in the 22 at Jacksonville; and 39 in the 14 ships at Angel Island). None of these rats was plague-infected.

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[7] Also 2 ships in Cuba were fumigated before unloading.

INTERNATIONAL RÉSUMÉS

The summary presents a table showing the number of plague rats found in 1936, and is reproduced here in its essentials in table 3:

TABLE 3.—*Plague rats found in ports and on ships in 1936*

Country	Port	Number of plague rats reported	Remarks
	A. Ports and maritime cities		
Algeria	Algiers	56	*Suspected;* 51 in city, 5 on the quays.
	Oran	1	*Suspected* in the city.
Argentina	Buenos Aires	7	In 1935, 17 plague rats; 15 at Santa Fe, and 2 at Bahia Blanca.
British India and Burma	Bassein	4	Also in the city at Rangoon, 15 plague rats.
Ceylon	Colombo	8	In the city, 39 plague rats.
Ecuador	Guayaquil	50	
France	Marseille	7	All in the city.
Hawaiian Islands	Hawaii Island	23	
	Maui Island	3	
Iraq	Baghdad	9	
Peru	Salaverry	6	
	Pacasmayo	3	
	Callao	19	
Tunisia	Tunis	34	In 1935, 11 plague rats at Tunis.
Total		230	
	B. On ships		
England	Liverpool	4	From a grain-laden vessel.

If there are added to this total the number of rats captured in the city in Colombo and Rangoon and found plague-infected (54), the total number of rats found plague-infected in ports in 1936 is 284, as compared with 435 in 1935, 401 in 1934, 721 in 1933, 864 in 1932, and 078 in 1931.

CONCLUSION

As these summaries continue to appear (the health authorities of more than 100 countries sending in the information requested), the idea that practical results may be obtained from the campaign against rats in ports and on board ship becomes increasingly justified. Two interesting facts appear from these 6 years of study: The first is that the number of plague rats in ports has been reduced approximately 75 percent in 6 years, decreasing from 978 in 1931 to 284 in 1936. The second is that sanitary conditions are rapidly improving on the ships constituting the merchant fleet of the world. In 1936 the number of certificates of exemption from deratization surpassed for the first time the number of certificates of deratization (15,238 against 15,233); whereas in 1931, the first year in which a summary of this information was issued, there were no more than 9,273 certificates of exemption (4,319 in England and 1,923 in the United States) as against 13,634 certificates of deratization.

These two facts, one relating to the number of plague rats found in ports, and the other to the number of exemption certificates as compared with the number of deratization certificates, permit one to state that the sanitary condition, both of ports and ships, has improved greatly, thanks to the ceaseless efforts of the maritime health authorities of practically all the countries in the world in this campaign against rat infestation.

Comment

By Bolivar J. Lloyd, *Assistant to the Director, Pan American Sanitary Bureau, Medical Director (Retired), United States Public Health Service*

In the very interesting summary of deratization activities prepared by the International Office of Public Health, of Paris, attention is called to the fact that in American countries about three deratization certificates are given for each exemption certificate, while in the entire group of 68 countries reporting on this subject to the Office International d'Hygiène publique, there were, during the same year, practically the same number of ships deratized as were given certificates of exemption. The article further calls attention to the fact that in Argentina the disproportion between the number of deratization certificates and the number of certificates of exemption was far greater than in any other country in the entire group (3,968 deratizations to 42 exemptions, a ratio of approximately 94 to 1). It is inferred that the merchant ships which call at Argentine ports are probably old vessels in which rats multiply easily, and that many of these vessels carry large quantities of grain, a cargo that always attracts great numbers of rats. The author infers that these two factors are the cause of the abnormally high proportion of deratizations as against exemptions in Argentina.

It is suggested that these inferences or generalizations are perhaps based upon incomplete evidence, but more especially upon failure to classify the vessels fumigated into (*a*) those from foreign ports and (*b*) those plying between ports in the Republic of Argentina. The importance of such classification will be seen at once when we observe the relatively small number of vessels from foreign ports as compared with domestic vessels and the disproportionately large numbers of rats obtained from vessels from foreign ports, as a rule. The additional data given here are from official reports.

Of 163 vessels from foreign ports inspected in Argentina during 1935, 97 were fumigated, 53 were exempted, and 13 were granted extensions by the Argentine authorities. During the same period 3,757 domestic vessels were fumigated. Of the 97 foreign vessels fumigated, 52 had certificates of exemption or of fumigation issued within the preceding 6 months (*1*). It may be assumed that the relative proportion of foreign to domestic vessels was approximately the same in 1936 and 1937 as in the year 1935. In the accompanying table it will be observed that occasionally a ship was fumigated in an Argentine port and after a lapse of several months the vessel was again fumigated in Argentina. This means that the vessel made an outward voyage and was not again fumigated until it returned to Argentina.

Foreign vessels fumigated in ports of the Republic of Argentina though possessing certificates of fumigation or exemption issued within the preceding 6-month period. (Translation; slightly abridged.)

Name and nationality of vessel	Place of last previous fumigation or exemption, and method of fumigation.		Time elapsed since last fumigated or exempted		Rats recovered before and after fumigation (fumigation in Argentina)	
			Months	Days	Before	After
1935						
British "S_1————"[1]	Calcutta	Exemption	2	22		228
Italian "V_1————"	Newport	do	1	20		16
British "N_1————"	Calcutta	do	2	19	13	115
Dutch "B_1————"	Havre	do	5	19		32
Belgian "B_2————"	Antwerp	Cyanide	2	5	9	52
French "E_1————"	Cardiff	Sulfur	4	23		180
British "B_3————"	London	Exemption	4	24	15	39
Brazilian "J_1————"	Rio de Janeiro	Sulfur	3	11	23	30
Greek, "P_1————"	Antwerp	Exemption	2			7
Finnish "R_1————"	Rouen	do	5	22	10	32
Greek "Z_1————"	Barry	do	2	14		30
British "L_1————"	do	Sulfur	4	12	3	24
French "C_1————"	Antwerp	Exemption	1	14		82
Danish "A_1————"	Copenhagen	do	5	5		154
Greek "A_2————"	Kiel	do	1	27	11	90
Jugoslav "P_2————"	Barry	Sulfur	2	3		54
Greek "N_2————"	Cardiff	Exemption	1	18		47
British "S_2————"	Antwerp	Cyanide	3	14		15
Greek "F_1————"	Piraeus	Sulfur	2	23	7	6
Greek "D_1————"	do	do	2	2		45
Finnish "A_3————"	Danzig	Exemption	1	15	19	22
German "E_2————"	Hamburg	Sulfur	1	11	18	170
Jugoslav "P_3————"	New York	Cyanide	5	4	8	55
Swedish "T_1————"	Rio de Janeiro	Sulfur	1	10		51
British "U————"	Swansea	do	2	4		45
Belgian "M_1————"	Antwerp	Cyanide	3	17		5
English "R_2————"	Cardiff	Sulfur	1	6	11	28
Finnish "R_1————"	Buenos Aires	do	4	23		68
Brazilian "A_4————"	Rio de Janeiro	do	3	19		41
Spanish "A_5————"	Barry	Exemption	4	25		246
British "R_3————"	Rotterdam	do	3	5		27
British "G_1————"	Galveston	Cyanide	4		10	46
Jugoslav "L_2————"	Barry	Exemption	5	5	3	52
Greek "N_3————"	Cardiff	do	4	3		61
Belgian "H_1————"	Antwerp	Cyanide	2	3	8	63
Greek "T_2————"	Buenos Aires	do	2	3	9	51
British "L_3————"	Tyne	Sulfur	4	16		68
German "I_4————"	Hamburg	do	2	14	13	32
Greek "G_2————"	Buenos Aires	do	4	21		34
British "L_5————"	Cardiff	Exemption	4	18		3
Argentine "J_2————"	Buenos Aires	Cyanide	5	7	6	18
Greek "Z_2————"	Antwerp	do	2			4
Greek "N_4————"	Rio de Janeiro	Sulfur	4			46
British "G_2————"	Cardiff	Exemption	1	24		24
Swedish "V_2————"	Goteburg	Cyanide	1	16	9	58
Greek "A_6————"	Piraeus	Sulfur	3	23	1	40
Brazilian "C_2————"	Rio de Janeiro	Cyanide	4	17	12	40
French "C_1————"	Bahia Blanca	do	5	19		79
Dutch "A_7————"	Cardiff	Exemption	1	3		43
Greek "E_3————"	Copenhagen	do	2	1	5	28
British "O_1————"	Barry	do	5	10		33
British "P_4————"	Swansea	do	3	14	1	9
Danish "A_1————"	Bahia Blanca	Fumigation	5	27		154
French "C_1————"	do	do	5	19		73

Foreign vessels fumigated in ports of the Republic of Argentina though possessing certificates of fumigation or exemption issued within the preceding 6-month period. (Translation; slightly abridged.)—Continued.

Name and nationality of vessel	Place of last previous fumigation or exemption, and method of fumigation.		Time elapsed since last fumigated or exempted		Rats recovered before and after fumigation (fumigation in Argentina)	
			Months	Days	Before	After
1936 (Incomplete)						
French “P$_5$———”	Antwerp	Fumigating	1			36
Dutch “W$_1$———”	Amsterdam	do	3	5		83
Greek “T$_3$———”	Havre	do	2	7		166
German “P$_6$———”	Hamburg	Exemption				28
German “P$_7$———”	do	Fumigation	2	4		40
French “P$_8$———”	Antwerp	do	1			30
Danish “A$_1$———”	Buenos Aires	do	3	31		170
Finnish “A$_3$———”	Kotka (Fin.)	Exemption	1	13		59
Greek “G$_3$———”	Genoa	Fumigation	4			107
German “W$_2$———”	Hamburg	Exemption	1	20		33
——— “N$_5$———”	Barry Dock	Sulfur	4	3		111
Greek “I$_1$———”	Enden	Exemption				57
British “O$_2$———”	Cardiff	Fumigation	1	9		34
British “M$_2$———”	do	do	1	3		34
British “R$_4$———”	do	do	1		12	53
Spanish “A$_8$———”	Newport Mon.	Exemption	1	5		34
British “H$_2$———”	do	Fumigation	1	20		29
——— “J$_3$———”	Swansea	Exemption	2	9	7	45
Jugoslav “M$_3$———”	Antwerp	do	5		8	71
——— “C$_3$———”	Rio de Janeiro	Fumigation	2	8	[2] 11	76
Jugoslav “I$_2$———”	Antwerp	Exemption			2	27
1937 (Incomplete)						
Brazilian “D$_2$———”	Rio de Janeiro	Fumigation	5	11	14	304
Greek “F$_2$———”	Antwerp	do	3	11		57
British “S$_3$———”	Bordeaux	Exemption	1	24	3	47
Greek “K———”	Amsterdam	do	2	2	16	147
British “N$_6$———”	Glasgow	Fumigation	5	21		75
Spanish “A$_9$———”	Bilbao	do	1	30		72
Greek “Z$_1$———”	Barry	Sulfur	4	8		77
Greek “P$_9$———”	do	Exemption	1	13	6	81
Norwegian “V$_3$———”	Havre	do	2		12	68
Finnish “S$_4$———”	Stockholm	do	1	6		87
Greek “N$_7$———”	Barry	Sulfur	1	19	6	48
Jugoslav “S$_5$———”	Helsingfors	Exemption	2	9	5	48
French “M$_4$———”	Antwerp	Fumigation	4		[3] 10	72
British “C$_4$———”	Rotterdam	do	3	20	24	40
Greek “O$_3$———”	Constanza	Sulfur	3	3		108
Brazilian “B$_4$———”	New Orleans	Fumigation	2	7	9	50

[1] The full name of the vessels may be found in the original (1).

[2] 8 young.

[3] 52 young.

Referring to the text of the report to the Office International d'Hygiène publique and also to the report of Dr. Sussini, Director of Health of Argentina for the year 1935 (*1*), it is possible to make the following analysis:

Of the 97 foreign vessels fumigated in Argentine ports in 1935, complete reports were made of 52, perhaps because they were heavily rat-infested notwithstanding their certificates. Of these 52, 23 possessed unexpired certificates of exemption, and on them 1,420 rats were found, or an average of 62 rats per vessel; 17 had been fumigated with sulfur within 6 months, and from these 960 rats were obtained, or an average of 56 rats; 12 had been previously fumigated with cyanide within the period stated, and from these 491 rats were recovered, or an average of 41 rats per ship (*1*). In all, 2,871 rats were found on these 52 vessels, or an average of approximately 55 rats per vessel.

It remains now to inquire how many domestic vessels were fumigated and what was the average number of rats found per vessel on this class of ships as compared with vessels from foreign ports, assuming that these vessels were searched after fumigation in the same manner as were foreign ships. However, there were so many of these national vessels, and as they were fumigated every 3 to 6 months (*1*) regardless of whether there was evidence of rats on board or not, it would not be surprising to learn that it was not considered necessary always to search them after fumigation, a task involving no inconsiderable amount of work.

The report of the Office International states that an aggregate of 3,854 vessels were fumigated in Argentina during 1935, from which 6,830 rats were obtained. Of 163 foreign vessels inspected (Dr. Sussini's report), 52 were fumigated and the number of rats reported (2,871); while 45 were fumigated and the numbers of rats found were included with those of the domestic vessels.[7] Subtracting the 2,871 rats found on the 52 known foreign vessels from the total of 6,830 rats found on all vessels, we have left 3,959 rats found on 3,757 domestic and 45 foreign ships, the rats of these latter not being accounted for separately. This makes a total of 3,802 vessels fumigated, mostly domestic, on which 3,959 rats were found, or an average of slightly more than 1 rat per vessel.

Only 21 foreign vessels were reported to the Pan American Sanitary Bureau as having been fumigated in Argentina in 1936, but only those that, despite having valid certificates, were heavily rat-infested, were reported to the Bureau. From these a total of 1,392 rats was recovered, or an average of 66 rats per vessel; 15 had been fumigated within 6 months, and 6 had certificates of exemption. No data are available with regard to domestic vessels for this year, other than as given in the report of the Office International d'Hygiène publique, in which all vessels fumigated are grouped together.

Now, if we exclude from our reckoning the 21 heavily infested ships of 1936 and their 1,392 rats, we have left 3,833 vessels (mostly domestic) from which 4,498 rats were obtained, or an average of approximately 1.2 rats per vessel for that year. We do not know how many of these 3,833 vessels were from foreign ports; we know that 42 vessels were exempted and, as domestic vessels were practically never exempted when the 3 or 6 months period had elapsed, it may be assumed that these 42 were foreign, making a total of 63 foreign vessels accounted for. There could not have been more than 100 or 125 additional.

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[7] In 1935, 53 foreign vessels exempted and 13 prorogued for 30 days (1)

For the period January 1 to July 31, 1937, 16 foreign vessels were reported to the Pan American Sanitary Bureau as having been fumigated in Argentine ports, from which 1,381 rats were recovered, or an average of 86 rats per vessel. Again no data are available for domestic vessels, nor is any statement made with regard to the number of foreign vessels fumigated but not reported.

Referring to vessels fumigated in Argentina in 1935 (*1*), Dr. Sussini, in his report to the Third Pan American Conference of National Directors of Health, made the following observations:

> Argentina is first among nations in the number of vessels fumigated in her ports because of the fact that all of our own (Argentine) ships are fumigated every 3 to 6 months without exception or exemption, the time varying according to whether sulfur or cyanide was used when the vessel was last fumigated.
>
> * * * The extensive investigations of vessels which we have carried out with the aim of determining their rat population have revealed to us that the number of rats harbored is much larger than one would suppose, in spite of the forward-looking provisions of sanitary conventions. * * *
>
> We attribute the present defective status of rodent-prevention work on board vessels not to the imperfection of the hygienic principles wisely codified in conventions and in the sanitary regulations in force in various countries, but, be it said frankly, to the tolerance or negligence of the authorities or the insufficiency of health departments. Combined with these causes, the desire of certain countries to facilitate traffic in their ports has prevented the development among those on board ship of an adequate comprehension of the danger, and has brought about a lack of cooperation with the health authorities, so that it may be asserted that there is not among ships' personnel one ally, determined and interested, in the fight against rodents.
>
> Aware of this situation, at the end of the year 1934, after having prepared a select personnel to carry out rodent control on board, we began investigations especially directed against vessels which were suspicious to us because of their origin, because of their having been exempted from fumigation, or because they came to load grain; demonstrating that in a goodly number of them rats existed in open contradiction of the testimony offered in the certificates of fumigation or exemption which they carried. * * *
>
> In previous times, by virtue of the faith in their certificates, these boats would have pursued their traffic tranquilly armed with the bill of indemnity given by their papers. With our new procedure we try to avoid the propagation of rats on board ship and, consequently, epizootics, thus fulfilling one requirement of plague prevention, all the more important to our country because it is a grain-exporting one.
>
> Our system of rat control on vessels disregards certification as to the sanitary conditions until an inspection has been made concerning rodent status.
>
> The existence of live rats seen during the inspection, evidence of an unusual mortality, and the finding of abundant traces of rats are the signal for a more thorough search complemented by the placing of traps on board in order to estimate the extent of the rodent population and to determine whether or not the vessel should be fumigated * * *.

It would seem from the foregoing tables and from Dr. Sussini's lucid if pungent comment (by no means unwarranted) in explanation of his policies that his position with regard to fumigation of rat-infested vessels is well taken; if he has erred, it has been in his somewhat more rigorous treatment of Argentine vessels and not in the case of vessels from foreign ports.

REFERENCE

(1) Actas de la Tercera Conferencia Panamericana de Directores Nacionales de Sanidad (April 4–15, 1936), pp. 223–231.

Comment

By C. L. Williams, *Assistant Surgeon General, Division of Foreign and Insular Quarantine and Immigration, United States Public Health Service*

Under date of March 1, 1938, the Quarantine Division of the United States Public Health Service issued to its principal stations a letter transmitting a summary regarding fumigations and rats recovered for various countries, including the United States and Argentina, in which skepticism was expressed as to the value of exemption certificates issued in England and France, based in this instance on the fact that the rats per ship killed by fumigation in those countries was very high, suggesting that only heavily infested ships were fumigated. This skepticism finds support in the itemized figures presented by Dr. Lloyd, wherein are listed large numbers of rats killed on ships in Argentina despite certification, at foreign ports, of deratization or exemption within relatively short periods. It is only fair to state that in England, and possibly other countries, permissible infestation is set at a higher level than in the United States, where an estimate of more than five rats is generally sufficient basis for fumigation. Conversely, of course, vessels infested with fewer than five rats are seldom fumigated in the United States, so that the figure showing rats per fumigated ship is not materially lowered by inclusion of vessels found uninfested.

CANCER MORTALITY IN THE UNITED STATES FOR 1936 AND RECENT PRECEDING YEARS

The accompanying table (table 1) gives the number of deaths from cancer in the United States for 1936 and certain prior years according to the principal anatomical site of the tumor and by sex of the decedent. It is taken from a report[1] recently issued by the Bureau of the Census, Department of Commerce.

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[1] Vital Statistics—Special Reports, vol. 4, No. 54, April 29, 1938, p. 962.

In 1936 cancer was second among the diseases as a cause of death in the United States, with a rate of 111.0 per 100,000 population, as compared with a rate of 265.8 for diseases of the heart, which held first place as "Captain of the men of death." In 1935 the cancer death rate was 107.9, 106.2 in 1934, 102.2 in 1933, and 102.0 in 1932. These rates may be compared with a rate of 83.2 in 1920 and of 97.2 in 1930.

TABLE 1.—*Number of deaths from cancer, by sex and site, in the registration area 1936 and prior years*

Cause of death	1936		1935		1930 [1]		1925 [1]		1920 [1]	
	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Cancer and other malignant tumors (45-53)	65, 545	77, 068	62, 933	74, 716	51, 777	63, 488	41, 865	53, 630	30, 933	41, 998
Cancer of the buccal cavity and pharynx (45)	4, 004	980	3, 982	923	3, 685	869	3, 475	759	2, 335	462
Lip	681	83	671	56	540	46	483	70	393	44
Tongue	887	210	878	198	800	147	749	117	609	69
Mouth	487	133	441	109	335	104	285	56	176	61
Jaw	724	226	776	223	811	240	888	223	856	204
Other and unspecified parts of buccal cavity	524	126	466	134	411	109	295	76	211	56
Pharynx	701	211	750	203	788	223	775	217	90	28
Cancer of the digestive tract, peritoneum (46)	36, 280	31, 959	35, 224	31, 237	30, 431	27, 381	25, 375	24, 080	19, 058	19, 285
Esophagus	1, 846	540	1, 715	541	1, 464	432	1, 307	352	871	232
Stomach and duodenum	16, 210	11, 031	16, 077	11, 027	14, 847	10, 561	(2)	(2)	(2)	(2)
Intestines (except duodenum, rectum, anus)	6, 833	8, 531	6, 428	8, 037	4, 826	6, 170	(2)	(2)	(2)	(2)
Rectum and anus	3, 975	3, 350	3, 824	3, 237	2, 764	2, 431	2, 082	1, 959	1, 373	1, 443
Liver and biliary passages	4, 490	5, 935	4, 434	6, 045	4, 452	5, 936	4, 028	5, 530	3, 450	5, 193
Pancreas	2, 446	1, 994	2, 309	1, 809	1, 656	1, 313	991	911	665	515
Mesentery and peritoneum	462	560	424	526	398	497	349	471	259	425
Others under this title	18	18	13	15	24	41	25	45	20	34
Cancer of the respiratory system (47)	4, 931	1, 909	4, 478	1, 723	2, 688	1, 160	(2)	(2)	(2)	(2)
Larynx	1, 069	170	987	165	854	129	636	138	409	90
Lungs and pleura	3, 099	1, 549	2, 951	1, 405	1, 673	980	989	739	527	429
Other respiratory organs	763	190	540	153	161	51	(2)	(2)	(2)	(2)
Cancer of the uterus (48)	------	16, 280	------	15, 853	------	14, 132	------	12, 377	------	9, 848
Cancer of other female genital organs (49)	------	3, 553	------	3, 345	------	2, 290	------	1, 674	------	949
Ovary and Fallopian tube	------	2, 941	------	2, 795	------	1, 833	------	1, 218	------	652
Vagina and vulva	------	568	------	509	------	409	------	398	------	247
Other female genital organs	------	41	------	41	------	48	------	58	------	50
Cancer of the breast (50)	171	13, 537	162	13, 064	138	10, 774	138	8, 373	88	6, 577
Cancer of the male genito-urinary organs (51)	12, 356	------	11, 702	------	8, 661	------	(2)	------	(2)	------
Kidneys and suprarenals (male)	1, 244	------	1, 178	------	924	------	717	------	439	------
Bladder (male)	3, 148	------	3, 014	------	2, 512	------	2, 095	------	1, 494	------
Prostate	7, 110	------	6, 765	------	4, 648	------	3, 068	------	1, 597	------
Testes	476	------	412	------	270	------	227	------	143	------
Scrotum	26	------	34	------	30	------	16	------	(2)	------
Other male genito-urinary organs	322	------	209	------	277	------	(2)	------	(2)	------
Cancer of the skin (52)	2, 065	1, 339	2, 113	1, 278	1, 852	1, 167	1, 636	988	1, 505	862
Cancer of other or unspecified organs (53)	5, 738	7, 502	5, 272	7, 293	4, 322	5, 715	(2)	(2)	(2)	(2)
Kidneys and suprarenals (female)	------	831	------	870	------	705	------	541	------	381
Bladder (female)	------	1, 505	------	1, 485	------	1, 172	------	913	------	650
Brain	750	534	654	487	467	337	223	200	96	88
Bones (except of jaw)	1, 063	913	889	875	858	753	591	558	343	406
Other or unspecified organs	3, 925	3, 719	3, 729	3, 576	2, 997	2, 748	(2)	(2)	(2)	(2)

[1] The percent of population included in registration area for 1930 was 96.2; 1925, 89.6; 1920, 82.3.
[2] Not comparable.

Cancer has shown an almost continuous apparent increase in the United States since 1900; but as it is largely an old-age disease, no accurate measure of any actual change can be made without taking into consideration the changing age distribution of the population; and other factors, such as improvement in diagnosis and increase in the accuracy of vital statistics, must also be considered. Some investigators have presented standardized data showing actual increases in the general cancer death rate, especially among males,[2] [3] as well as in rates for the higher age groups [4] and for cancer of inaccessible sites.[3]

In a recent analysis of cancer mortality among a large group of policyholders over the period 1911–35,[3] Dr. Louis I. Dublin found that the death rate from this cause showed a moderate upward trend during that period, independent of changes in the composition of the population, but concluded that much, if not all, of the increase was spurious. He states that the increase was practically limited to males, and that among white males the increase was significantly large only at ages above 55 years. Such increase as appeared among white females occurred at ages above 65, while in the broad age period 35–54 the trend was significantly downward. Dr. Dublin states that this difference in the trends by sex must be viewed in the light of the fact that about four-fifths of the cancers among males, but only half of the cancers among females, occur in inaccessible sites. "Thus, improvements in diagnosis over the 25-year period would tend to raise the recorded mortality for males more than for females. In general, cancers of inaccessible sites show a rise in death rate, whereas those in accessible sites exhibit a downward trend."

In 1900 the median age of the population of the United States was 22.8, while in 1930 it was 26.4. In 1930, males comprised 50.6 percent of the population, females 49.4 percent.

TABLE 2.—*Cancer death rate per 100,000 estimated population, 1932–36*

State	1936	1935	1934	1933	1932
United States	111.0	107.9	106.2	102.2	102.0
Alabama	60.3	60.3	56.4	57.1	56.0
Arizona	76.1	73.4	76.6	61.9	64.7
Arkansas	50.0	48.5	46.5	39.7	43.1
California	144.0	139.6	183.2	120.9	127.2
Colorado	116.7	112.2	110.1	103.6	105.2
Connecticut	129.5	130.5	128.9	127.4	122.5
Delaware	122.0	114.1	112.6	119.6	117.8
District of Columbia	140.2	132.8	140.4	138.7	139.5
Florida	88.4	87.9	83.5	81.8	80.4
Georgia	57.9	56.5	59.0	55.4	52.0
Idaho	92.6	77.9	79.9	82.8	75.0
Illinois	132.0	128.8	124.1	118.6	117.4
Indiana	115.4	116.0	114.6	109.0	111.8
Iowa	131.9	126.9	123.6	120.8	119.9

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[2] The mortality from cancer. A study of the experience among the industrial policyholders of the Metropolitan Life Insurance Co., 1911–30. Monograph 1.

[3] Statistics on morbidity from cancer in the United States. By Louis I. Dublin, Amer. J. Cancer, vol. 29, No. 4 (April 1937), pp. 736–742.

[4] Cancer mortality in the 10 original registration States—Trend for the period 1900–1920. By J. W. Schereschewsky. Pub. Health Rep., vol. 41, No. 1 (Jan. 1, 1936) pp. 1–12.

TABLE 2.—*Cancer death rate per 100,000 estimated population, 1932–36*—Contd.

State	1936	1935	1934	1933	1932
Kansas	114.5	109.7	113.0	108.0	105.3
Kentucky	74.6	71.0	73.6	73.9	74.3
Louisiana	81.7	80.8	74.0	74.1	71.5
Maine	151.3	148.5	140.6	141.7	144.1
Maryland	128.1	128.6	126.9	119.4	117.4
Massachusetts	153.0	147.7	153.6	147.3	143.1
Michigan	116.4	110.8	111.9	105.1	101.3
Minnesota	133.5	131.4	130.4	131.0	127.2
Mississippi	64.6	59.8	58.5	56.8	56.5
Missouri	118.0	117.5	118.6	109.1	111.5
Montana	106.8	99.4	89.8	95.3	95.9
Nebraska	114.7	110.5	112.8	104.4	103.9
Nevada	95.0	89.9	98.0	85.4	89.5
New Hampshire	148.2	155.4	151.2	149.1	155.8
New Jersey	124.7	120.3	119.8	115.8	110.8
New Mexico	55.7	54.0	57.8	51.2	52.4
New York	148.4	144.4	137.8	133.4	128.6
North Carolina	51.6	52.1	52.2	51.9	49.9
North Dakota	83.5	79.7	83.8	75.9	75.8
Ohio	127.5	123.3	120.4	113.9	114.8
Oklahoma	67.6	60.5	63.0	60.9	55.7
Oregon	135.1	122.9	130.2	127.8	116.7
Pennsylvania	118.9	114.5	113.9	108.2	107.7
Rhode Island	145.5	146.8	137.6	140.8	145.0
South Carolina	50.6	49.1	52.7	48.2	41.6
South Dakota	90.9	91.2	87.9	83.5	82.9
Tennessee	67.9	66.3	64.7	60.7	59.1
Texas	73.6	68.5	66.3	64.5	(1)
Utah	81.2	85.2	79.6	78.4	78.1
Vermont	137.6	139.5	125.1	127.8	137.0
Virginia	77.8	78.5	76.3	75.0	72.0
Washington	133.3	132.5	130.2	120.9	112.6
West Virginia	71.6	72.1	68.3	67.6	63.4
Wisconsin	135.0	132.2	128.4	123.4	122.2
Wyoming	73.8	67.2	74.9	71.7	69.0

[1] Not in the death registration area in 1932.

Table 2, compiled from the Vital Statistics Summaries for States, issued as special reports by the Bureau of the Census, presents the death rates for cancer for the United States and for each State from 1932 to 1936. The lowest rate in 1936 is that for Arkansas, 50, and the highest is that for Massachusetts, 153. New Hampshire was the only State that registered a decrease in 1936 as compared with 1932, although only very small increases were shown for several other States, notably Kentucky, New Mexico, North Carolina, Rhode Island, and Vermont.

Without detailed analysis it would appear that the differential factor of greatest importance involved in the difference between the cancer mortality rates for the northern States and those for the southern States is the Negro population, as the rate is much lower among the Negroes than among white persons. In a review of cancer mortality among a large group of industrial insurance policyholders for the decades 1911–30, it has been shown[4] that, for ages 1–74 combined, the cancer death rate among white persons exceeded that for the colored by 78 percent for males and by 5 percent for females.

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[4] See footnote 2.

TABLE 3.—*Death rates for cancer per 100,000 estimated population by geographical regions, 1936*

New England	146.5
Maine	151.3
New Hampshire	148.2
Vermont	137.6
Massachusetts	153.0
Rhode Island	145.5
Connecticut	129.5
Middle Atlantic	133.7
New York	148.4
New Jersey	124.7
Pennsylvania	118.9
East North Central	126.0
Ohio	127.5
Indiana	115.4
Illinois	132.0
Michigan	116.4
Wisconsin	135.0
West North Central	119.6
Minnesota	133.5
Iowa	131.9
Missouri	118.0
North Dakota	83.5
West North Central—Continued	
South Dakota	90.9
Nebraska	114.7
Kansas	114.5
South Atlantic	74.2
Delaware	122.0
Maryland	128.1
District of Columbia	140.2
Virginia	77.8
West Virginia	71.6
North Carolina	51.6
South Carolina	50.6
Georgia	57.9
Florida	88.4
East South Central	67.1
Kentucky	74.6
Tennessee	67.9
Alabama	60.3
Mississippi	64.6
West South Central	70.0
Arkansas	50.0
Louisiana	81.7
Oklahoma	67.6
Texas	73.6
Mountain	92.8
Montana	106.8
Idaho	92.6
Wyoming	73.8
Colorado	116.7
New Mexico	55.7
Arizona	76.1
Utah	81.2
Nevada	95.0
Pacific	140.9
Washington	133.3
Oregon	135.1
California	144.0

TABLE 4.—*Relative position of the States with respect to cancer mortality—States with rates above and below the rate for the United States in 1936*

[Death rates from cancer per 100,000 population]

Massachusetts	153.0
Maine	151.3
New York	148.4
New Hampshire	148.2
Rhode Island	145.5
California	144.0
District of Columbia	140.2
Vermont	137.6
Oregon	135.1
Wisconsin	135.0
Minnesota	133.5
Washington	133.3
Illinois	132.0
Iowa	131.9
Connecticut	129.5
Maryland	128.1
Ohio	127.5
New Jersey	124.7
Delaware	122.0
Pennsylvania	118.9
Missouri	118.0
Colorado	116.7
Michigan	116.4
Indiana	115.4
Nebraska	114.7
Kansas	114.5
United States	111.0
Montana	106.8
Nevada	95.0
Idaho	92.6
South Dakota	90.9
Florida	88.4
North Dakota	83.5
Louisiana	81.7
Utah	81.2
Virginia	77.8
Arizona	76.1
Kentucky	74.6
Wyoming	73.8

TABLE 4.—*Relative position of the States with respect to cancer mortality—States with rates above and below the rate for the United States in 1936*—Continued

Texas	73. 6
West Virginia	71. 6
Tennessee	67. 9
Oklahoma	67. 6
Mississippi	64. 6
Alabama	60. 3
Georgia	57. 9
New Mexico	55. 7
North Carolina	51. 6
South Carolina	50. 6
Arkansas	50. 0

In tables 3 and 4 the cancer mortality data issued by the Bureau of the Census are arranged by geographic divisions and by groups of States having rates above and below the rate for the country as a whole. The rates for the geographic areas have been computed from the deaths by States furnished by the Census Bureau.

The Public Health Service has now in process of preparation a study of the trend of cancer mortality in the United States which will present an analysis of the problem with reference to geographic areas, age, sex, and racial composition of the population, and anatomical site. This study will bring to date an earlier report covering the period 1900–1920.[5]

DEATHS DURING WEEK ENDED APRIL 30, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Apr. 30, 1938	Corresponding week, 1937
Data from 86 large cities of the United States:		
Total deaths	8, 459	8, 858
Average for 3 prior years	9, 129	
Total deaths, first 17 weeks of year	150, 483	169, 821
Deaths under 1 year of age	518	497
Average for 3 prior years	590	
Deaths under 1 year of age, first 17 weeks of year	9, 227	10, 459
Data from industrial insurance companies:		
Policies in force	69, 407, 184	69, 704, 534
Number of death claims	13, 272	14, 151
Death claims per 1,000 policies in force, annual rate	10. 0	10. 6
Death claims per 1,000 policies, first 17 weeks of year, annual rate	10. 0	11. 4

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[5] The course of cancer mortality in the ten original registration States for the 21-year period 1900–1920. By J. W. Schereschewsky, Pub. Health Bull. No 155 (1925)

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred while leaders (------) indicate that cases or deaths may have occurred, although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 7, 1938 and May 8, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended May 7, 1938	Week ended May 8, 1937	Week ended May 7, 1938	Week ended May 8, 1937	Week ended May 7, 1938	Week ended May 8, 1937	Week ended May 7, 1938	Week ended May 8, 1937
New England States:								
Maine	3	1	2	------	177	28	1	0
New Hampshire	0	0	------	------	64	81	0	0
Vermont	0	1	------	------	83	------	0	0
Massachusetts	1	6	------	------	257	683	1	12
Rhode Island	0	1	------	------	3	218	0	3
Connecticut	7	6	5	1	56	373	0	0
Middle Atlantic States:								
New York	39	41	[1] 6	[1] 7	3, 615	1, 507	7	9
New Jersey	13	7	3	10	1. 070	1, 989	0	3
Pennsylvania	20	34	------	------	5, 699	1, 135	1	9
East North Central States:								
Ohio	23	9	------	11	1, 468	1, 015	2	5
Indiana	5	3	2	16	807	771	2	1
Illinois	25	27	6	39	1, 781	274	2	7
Michigan [2]	6	8	------	3	2, 714	169	1	3
Wisconsin	1	3	33	68	3, 086	23	1	0
West North Central States:								
Minnesota	3	3	3	2	254	15	3	4
Iowa	0	2	1	6	253	2	0	0
Missouri	27	4	24	65	598	12	1	0
North Dakota	0	0	8	2	152	------	1	0
South Dakota	1	1	------	------	------	2	0	1
Nebraska	2	0	------	------	233	76	0	2
Kansas	6	2	4	4	621	27	1	2
South Atlantic States:								
Delaware [3]	1	0	------	------	10	61	0	0
Maryland [2]	1	13	8	12	72	550	2	6
District of Columbia	0	5	1	------	8	103	1	1
Virginia	9	18	------	------	458	490	10	9
West Virginia	3	9	20	21	570	58	2	9
North Carolina [4]	12	8	49	31	2, 040	152	1	4
South Carolina	9	3	108	211	208	55	1	1
Georgia [4]	6	3	------	------	200	------	1	2
Florida [4]	7	3	2	------	216	14	0	1
East South Central States:								
Kentucky	13	5	7	16	206	445	7	7
Tennessee	3	14	10	80	179	84	1	7
Alabama [4]	3	6	29	174	342	25	6	10
Mississippi [2]	6	3	------	------	------	------	0	5

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 7, 1938 and May 8, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended May 7, 1938	Week ended May 8, 1937	Week ended May 7, 1938	Week ended May 8, 1937	Week ended May 7, 1938	Week ended May 8, 1937	Week ended May 7, 1938	Week ended May 8, 1937
West South Central States:								
Arkansas	4	3	19	66	316	2	0	0
Louisiana	11	14	9	16	75	6	0	1
Oklahoma [5]	4	12	75	74	251	79	3	4
Texas [4]	22	57	190	365	167	1,070	2	5
Mountain States:								
Montana	3	1			35	27	0	0
Idaho [3]	0	0	5	3	30	24	0	0
Wyoming [3] [6]	2	0			25	4	0	0
Colorado [6]	10	5			331	17	0	0
New Mexico	1	3	1		128	111	0	1
Arizona	3	1	13	32	18	169	0	0
Utah [2]	1	0			267	29	0	0
Pacific States:								
Washington	2	2		1	38	47	1	3
Oregon [3]	0	0	28	25	47	6	1	0
California	28	48	27	50	686	205	1	1
Total	346	395	698	1,411	30,034	12,293	64	138
First 18 weeks of year	9,654	8,872	39,725	268,019	586,013	140,252	1,480	2,995

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended May 7, 1938	Week ended May 8, 1937	Week ended May 7, 1938	Week ended May 8, 1937	Week ended May 7, 1938	Week ended May 8, 1937	Week ended May 7, 1938	Week ended May 8, 1937	Week ended May 7, 1938
New England States:									
Maine	0	0	18	20	0	0	1	1	36
New Hampshire	0	0		17	0	0	1	0	
Vermont	0	0	16	13	0	0	0	0	58
Massachusetts	0	1	325	256	0	0	1	2	124
Rhode Island	0	0	12	62	0	0	0	0	20
Connecticut	0	0	84	159	0	0	0	0	91
Middle Atlantic States:									
New York	2	1	769	979	0	0	6	7	546
New Jersey	0	0	135	188	0	0	4	1	244
Pennsylvania	2	0	801	894	0	0	8	6	319
East North Central States:									
Ohio	1	0	226	255	5	0	5	6	113
Indiana	0	0	73	150	47	23	5	1	17
Illinois	0	1	308	618	20	19	7	2	120
Michigan [3]	0	0	374	709	5	3	1	0	243
Wisconsin	1	0	128	296	11	3	4	0	179
West North Central States:									
Minnesota	0	0	142	132	11	25	1	0	23
Iowa	1	0	137	189	36	26	4	1	31
Missouri	0	0	241	192	19	25	1	8	25
North Dakota	0	0	41	15	15	33	0	3	57
South Dakota	0	0	13	46	18	1	0	0	25
Nebraska	0	0	21	68	36	4	0	0	6
Kansas	0	0	98	244	7	15	1	2	162
South Atlantic States:									
Delaware [3]	0	0	8	9	0	0	0	0	8
Maryland [3]	0	0	86	53	0	0	2	1	64
District of Columbia	0	0	20	13	0	0	1	0	5
Virginia	0	0	21	13	0	0	1	5	88
West Virginia	0	0	36	46	0	0	10	1	59
North Carolina [4]	0	1	19	31	0	0	5	0	497
South Carolina	0	0	1	2	0	0	7	2	108
Georgia [4]	1	0	5	8	0	0	8	5	71
Florida [4]	1	0	6	10	0	0	5	0	17

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 7, 1938 and May 8, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended May 7, 1938	Week ended May 8, 1937	Week ended May 7, 1938	Week ended May 8, 1937	Week ended May 7, 1938	Week ended May 8, 1937	Week ended May 7, 1938	Week ended May 8, 1937	Week ended May 7, 1938
East South Central States:									
Kentucky	0	0	19	45	10	0	0	4	59
Tennessee	0	1	27	23	2	0	3	3	29
Alabama [4]	1	1	4	4	0	2	6	0	34
Mississippi [2]	0	3	6	6	5	1	5	0	-------
West South Central States:									
Arkansas	1	2	4	10	3	0	4	2	26
Louisiana	0	1	4	22	1	0	7	9	2
Oklahoma [5]	0	3	15	36	32	2	3	1	85
Texas [4]	0	0	73	128	18	6	18	19	267
Mountain States:									
Montana	0	0	21	17	11	10	1	2	54
Idaho [3]	0	0	10	22	25	6	1	1	12
Wyoming [3] [6]	0	0	11	18	2	4	0	0	6
Colorado [6]	0	0	37	29	5	14	7	0	40
New Mexico	0	0	11	29	1	0	3	4	35
Arizona	1	0	5	11	6	0	1	3	44
Utah [2]	0	0	15	4	0	0	0	0	65
Pacific States:									
Washington	0	1	21	34	10	8	4	3	-------
Oregon [3]	0	0	41	39	18	10	0	0	11
California	0	5	226	174	75	12	6	5	536
Total	12	21	4,807	6,338	454	252	158	110	4,661
First 18 weeks of year	359	376	105,200	123,493	9,507	5,737	2,204	1,990	76,547

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[1] New York City only.

[2] Period ended earlier than Saturday.

[3] Rocky Mountain spotted fever, week ended May 7, 1938, 7 cases, as follows: Delaware, 1; Idaho, 4; Wyoming, 1; Oregon, 1.

[4] Typhus fever, week ended May 7, 1938, 32 cases, as follows: North Carolina, 2, Georgia, 11; Florida, 9; Alabama, 2; Texas, 8.

[5] Figures for 1937 are exclusive of Oklahoma City and Tulsa.

[6] Colorado tick fever, week ended May 7, 1938, 4 cases, as follows: Wyoming, 3; Colorado, 1.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
April 1938										
Arkansas	2	42	349	146	1,702	74	2	28	39	26
Connecticut	7	26	18	-------	146	-------	1	535	0	4
Delaware	0	7	0	-------	121	-------	0	51	0	1
Washington, D. C.	3	37	6	-------	86	2	0	99	0	3
North Carolina	7	51	34	26	10,470	33	3	118	2	6

Summary of monthly reports from States—Continued

April 1938

	Cases
Chickenpox:	
Arkansas	99
Connecticut	618
Delaware	80
District of Columbia	217
North Carolina	602
Conjunctivitis, infectious:	
Connecticut	-
Dysentery:	
Connecticut (bacillary)	1
Encephalitis, epidemic or lethargic:	
Connecticut	1
German measles:	
Arkansas	1
Connecticut	26
Delaware	2
North Carolina	14
Lead poisoning:	
Connecticut	

	Cases
Mumps:	
Arkansas	77
Connecticut	1,073
Delaware	98
Ophthalmia neonatorum:	
North Carolina	3
Paratyphoid fever:	
Connecticut	1
Rabies in animals:	
Arkansas	22
Connecticut	5
Delaware	1
Rabies in man:	
Arkansas	1
Septic sore throat:	
Arkansas	2
Connecticut	47
North Carolina	9
Tetanus:	
Arkansas	1
Connecticut	1

	Cases
Trachoma:	
Arkansas	1
Trichinosis:	
Connecticut	1
Tularaemia:	
Arkansas	4
Typhus fever:	
North Carolina	2
Undulant fever:	
Arkansas	5
Connecticut	8
Delaware	2
North Carolina	1
Vincent's infection:	
North Carolina	13
Whooping cough:	
Arkansas	221
Connecticut	256
Delaware	43
District of Columbia	54
North Carolina	1,646

PLAGUE INFECTION FOUND IN FLEAS FROM WOOD RATS IN NEVADA

Under date of May 2, 1938, Senior Surgeon C. R. Eskey reported plague infection found in fleas collected from Mohave Desert wood rats (*Neotoma fuscipes mohavensis*) in Clark County, Nevada, as follows:

165 fleas from 69 rats trapped April 14, 14½ miles northwest of Las Vegas.
115 fleas from 30 rats trapped April 18, 14 miles northwest of Las Vegas.
217 fleas from 79 rats trapped April 19, 17 miles northwest of Las Vegas.
188 fleas from 90 rats trapped April 20, 21 miles northwest of Las Vegas.
310 fleas from 111 rats trapped April 21, 23 miles northwest of Las Vegas.
291 fleas from 110 rats trapped April 22, 17 miles northwest of Las Vegas.

PLAGUE INFECTION FOUND IN GROUND SQUIRRELS AND FLEAS FROM GROUND SQUIRRELS IN OREGON

Under date of May 2, 1938, Senior Surgeon C. R. Eskey reported plague infection found in a ground squirrel (*Citellus oregonus*) and fleas from ground squirrels in Baker County, Oregon as follows:

Tissue obtained from one ground squirrel found dead April 22, 8 miles northwest of Hereford.

216 fleas from 125 ground squirrels shot April 23, 7 miles northwest of Hereford.

WEEKLY REPORTS FROM CITIES

City reports for week ended April 30, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	175	177	63	7,175	751	2,421	22	426	26	1,428	--------
Current week [1]	115	87	34	9,091	554	1,594	35	396	31	1,413	--------
Maine:											
Portland	0	------	0	8	1	1	0	0	0	15	28
New Hampshire:											
Concord	0	------	0	0	1	2	0	1	0	0	15
Manchester	0	------	0	0	1	5	0	0	0	0	21
Nashua	0	------	0	0	0	0	0	0	0	0	6
Vermont:											
Barre	------	------	------	------	------	------	------	------	------	------	------
Burlington	0	------	0	15	0	1	0	0	0	3	9
Rutland	0	------	0	0	1	0	0	0	0	0	7
Massachusetts:											
Boston	0	------	0	216	23	99	0	8	0	17	226
Fall River	1	------	0	0	1	3	0	1	0	2	30
Springfield	0	------	0	33	0	5	0	0	0	16	26
Worcester	2	------	0	1	10	16	0	1	0	8	52
Rhode Island:											
Pawtucket	0	------	0	4	0	0	0	0	0	3	19
Providence	0	1	0	1	12	11	0	1	0	11	66
Connecticut:											
Bridgeport	0	1	1	0	1	6	0	0	0	2	34
Hartford	0	------	0	0	2	24	0	0	0	1	39
New Haven	0	2	0	0	1	2	0	0	0	6	39
New York:											
Buffalo	0	------	0	3	7	55	0	6	0	14	157
New York	25	15	4	2,592	99	253	0	92	3	308	1,527
Rochester	1	------	0	6	6	24	0	2	0	5	71
Syracuse	0	------	0	36	6	2	0	2	0	7	50
New Jersey:											
Camden	0	------	0	25	2	7	0	1	0	3	27
Newark	0	1	0	10	8	18	0	10	1	33	115
Trenton	0	------	0	0	5	0	0	1	0	3	35
Pennsylvania:											
Philadelphia	3	------	5	826	36	108	0	19	2	39	505
Pittsburgh	2	------	0	113	15	35	0	11	1	37	169
Reading	0	------	0	13	4	1	0	0	1	4	33
Scranton	0	------	--------	30	-------	2	0	-------	0	1	--------
Ohio:											
Cincinnati	10	1	2	8	5	5	0	10	0	17	136
Cleveland	1	8	1	307	12	57	0	14	3	48	173
Columbus	1	------	0	66	4	6	0	4	0	4	83
Toledo	0	------	0	96	3	11	0	5	0	18	78
Indiana:											
Anderson	1	------	0	124	2	1	1	1	0	2	6
Fort Wayne	0	------	0	33	4	4	0	0	0	0	25
Indianapolis	5	------	0	307	12	27	3	5	0	7	94
Muncie	0	------	0	2	1	1	15	1	0	0	11
South Bend	1	------	0	112	1	5	1	0	0	0	20
Terre Haute	0	------	0	8	0	2	3	0	0	0	17
Illinois:											
Alton	0	------	0	1	1	1	0	0	0	0	7
Chicago	12	2	1	780	32	233	3	45	2	42	705
Elgin	0	------	0	0	0	9	0	0	0	1	9
Moline	0	------	0	4	2	7	0	0	0	1	11
Springfield	0	------	0	42	1	4	2	0	0	0	19
Michigan:											
Detroit	1	1	0	931	11	126	0	15	0	161	243
Flint	0	------	0	160	5	42	0	0	0	18	26
Grand Rapids	0	------	0	165	3	11	0	0	0	1	31
Wisconsin:											
Kenosha	0	------	0	125	0	0	0	0	0	1	5
Milwaukee	1	------	0	162	6	16	0	4	1	81	100
Racine	0	------	0	479	0	5	0	1	0	15	11
Superior	0	------	0	12	2	5	0	0	0	0	11

---

[1] Figures for Barre, Vt., and St. Joseph, Mo., estimated; reports not received.

City reports for week ended April 30, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	0	12	6	5	0	0	0	7	37
Minneapolis	1	------	0	134	4	19	6	1	0	4	86
St. Paul	0	------	0	3	7	9	0	3	0	4	65
Iowa:											
Cedar Rapids	0	------	--------	2	-------	5	0	-------	0	5	--------
Davenport	0	------	--------	0	-------	2	0	-------	0	0	--------
Des Moines	0	------	0	10	0	38	4	0	1	0	29
Sioux City	0	------	--------	29	-------	5	0	-------	0	4	--------
Waterloo	0	------	--------	77	-------	15	0	-------	0	0	--------
Missouri:											
Kansas City	1	------	0	15	12	13	0	7	0	0	104
St Joseph	------	------	--------	-------	-------	-------	-------	-------	-------	-------	--------
St. Louis	5	------	0	10	10	87	1	8	0	3	223
North Dakota:											
Fargo	0	------	0	0	0	0	0	0	0	9	10
Grand Forks	0	------	--------	56	-------	1	0	-------	0	0	--------
Minot	0	------	0	0	0	0	6	0	0	2	6
South Dakota:											
Aberdeen	0	------	--------	0	-------	0	0	-------	0	6	--------
Sioux Falls	0	------	0	0	0	1	1	0	0	0	11
Nebraska:											
Omaha	0	------	0	96	6	1	1	1	0	0	60
Kansas:											
Lawrence	0	------	0	40	0	0	0	0	0	0	11
Topeka	0	------	0	152	1	2	0	0	0	21	18
Wichita	0	------	0	26	3	2	1	0	0	5	25
Delaware:											
Wilmington	2	------	0	8	2	7	0	2	0	6	20
Maryland:											
Baltimore	1	3	2	19	14	53	0	16	0	44	211
Cumberland	0	------	0	3	1	1	0	0	0	2	16
Frederick	0	------	0	1	0	0	0	0	2	0	--------
Dist. of Col.:											
Washington	5	2	2	25	11	18	0	11	0	13	171
Virginia:											
Lynchburg	0	------	0	1	2	0	0	0	0	3	7
Norfolk	0	------	0	10	5	2	0	1	0	0	23
Richmond	0	------	1	113	6	2	0	3	0	0	53
Roanoke	0	------	0	2	1	1	0	0	0	0	9
West Virginia:											
Charleston	0	------	0	1	4	1	0	2	1	2	24
Huntington	0	------	--------	4	-------	0	0	-------	0	0	--------
Wheeling	0	------	0	307	4	6	0	1	0	1	35
North Carolina:											
Gastonia	0	------	--------	39	-------	0	0	-------	0	8	--------
Raleigh	0	------	0	99	1	1	0	1	0	5	18
Wilmington	0	------	0	38	1	0	0	0	0	9	13
Winston-Salem	0	1	0	25	2	0	0	0	0	32	12
South Carolina:											
Charleston	0	11	0	3	4	1	0	0	0	0	13
Florence	0	------	0	18	0	0	0	0	0	1	12
Greenville	0	------	0	6	1	0	0	0	0	8	13
Georgia:											
Atlanta	0	4	2	11	9	4	0	5	2	7	76
Brunswick	0	------	0	16	0	0	0	1	0	0	6
Savannah	1	1	1	26	1	0	0	1	0	0	37
Florida:											
Miami	0	------	0	14	2	0	0	3	0	4	37
Tampa	1	------	0	55	1	2	0	1	0	1	21
Kentucky:											
Ashland	0	------	0	5	1	1	0	1	0	8	6
Covington	12	------	0	0	0	5	0	1	0	4	29
Lexington	0	------	0	0	2	1	0	1	0	5	23
Louisville	0	------	0	160	5	19	0	6	0	13	72
Tennessee:											
Knoxville	0	------	0	29	5	2	0	2	0	4	28
Memphis	0	------	2	18	4	6	1	10	0	2	91
Nashville	0	------	2	67	6	0	0	2	0	6	40
Alabama:											
Birmingham	0	10	0	21	3	2	0	4	1	1	79
Mobile	0	------	1	4	4	0	0	1	0	0	25
Montgomery	0	------	--------	144	-------	0	0	-------	0	5	--------

City reports for week ended April 30, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Arkansas:											
Fort Smith	0	------	------	8	------	2	0	------	0	0	------
Little Rock	0	------	------	0	------	0	0	------	0	0	------
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	0	7
New Orleans	8	2	1	6	7	6	1	13	8	0	131
Shreveport	0	------	0	5	1	1	0	2	0	0	40
Oklahoma:											
Muskogee	0	------	------	1	------	0	0	------	0	0	------
Oklahoma City	0	------	0	3	4	5	0	0	0	6	51
Tulsa	0	------	------	163	------	4	5	------	0	18	------
Texas:											
Dallas	2	3	3	7	3	7	0	4	0	2	71
Fort Worth	0	------	0	1	3	4	0	4	0	8	27
Galveston	0	------	0	0	3	0	0	0	0	0	17
Houston	1	1	0	2	4	4	7	5	1	0	72
San Antonio	1	------	0	0	11	0	0	8	1	2	84
Montana:											
Billings	0	------	0	0	2	1	0	0	0	2	9
Great Falls	0	------	0	0	1	4	0	0	0	12	12
Helena	0	------	0	1	2	1	0	0	0	2	8
Missoula	0	------	0	0	0	0	0	0	0	0	7
Idaho:											
Boise	0	------	0	0	0	1	1	0	0	0	4
Colorado:											
Colorado Springs	0	------	0	1	1	2	0	1	0	1	14
Denver	7	------	1	95	6	17	0	1	0	6	91
Pueblo	0	------	0	36	0	1	0	0	0	7	7
New Mexico:											
Albuquerque	0	------	0	5	1	0	0	1	1	2	16
Utah:											
Salt Lake City	0	------	0	228	5	9	1	3	0	3	43
Washington:											
Seattle	1	------	2	1	9	4	0	4	0	79	109
Spokane	0	------	0	1	1	0	0	0	1	14	23
Tacoma	0	------	0	0	2	6	2	0	0	11	35
Oregon:											
Portland	0	------	0	14	6	17	1	3	0	3	67
Salem	0	------	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	11	14	0	59	11	49	1	12	0	12	312
Sacramento	1	------	0	35	1	2	0	0	0	64	26
San Francisco	0	3	0	3	14	23	0	9	0	85	162

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Boston	1	0	0
Rhode Island:			
Providence	0	1	0
New York:			
Buffalo	2	0	0
New York	2	2	0
Pennsylvania:			
Philadelphia	0	1	0
Pittsburgh	0	1	0
Scranton	1	0	0
Ohio:			
Columbus	1	1	0
Toledo	1	1	0
Indiana:			
Indianapolis	1	0	0

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Illinois:			
Chicago	1	0	0
Wisconsin:			
Milwaukee	0	0	1
Superior	1	0	0
Virginia:			
Norfolk	1	0	0
Kentucky:			
Louisville	0	0	1
Louisiana:			
Shreveport	0	1	0
Texas:			
Houston	1	0	0
California:			
Los Angeles	1	0	0

Encephalitis, epidemic or lethargic.—Cases: New York, 1; Newark, 1; Chicago, 3; Milwaukee, 1; Wheeling, 1; Louisville, 1.

Pellagra.—Cases: Chicago, 1; Charleston, S. C., 2; Tampa, 1; Savannah, 8; Mobile, 1; Montgomery, 1; Fort Smith, 2; Los Angeles, 2.

Typhus fever.—Cases: Charleston, S. C., 1; Atlanta, 1; New Orleans, 1; Galveston, 1; Los Angeles, 1.

FOREIGN AND INSULAR

CUBA

Provinces—Notifiable diseases—4 weeks ended April 2, 1938.—During the 4 weeks ended April 2, 1938, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana	Matanzas	Santa Clara	Camaguey	Oriente	Total
Cancer	1	3	1	2		3	10
Chickenpox	2	11	8	48	23	7	99
Diphtheria		20		1	10		31
Hookworm disease		135					135
Leprosy						3	3
Malaria	29	15	8	31	10	64	157
Measles	5	35	53	4		23	120
Poliomyelitis						1	1
Scarlet fever	1	3					4
Tuberculosis	21	44	12	44	40	33	194
Typhoid fever	28	144	7	23	24	65	291
Whooping cough				5			5
Yaws				23	1		24

PANAMA CANAL ZONE

Notifiable diseases—January–March 1938.—During the months of January, February, and March 1938, certain notifiable diseases, including imported cases, were reported in the Panama Canal Zone and terminal cities as follows:

Disease	January		February		March	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chickenpox	17		13		30	
Diphtheria	11		19	1	7	
Dysentery (amoebic)	7		13	2	12	2
Dysentery (bacillary)	8	3	14	8	19	1
Leprosy	1	1		1	2	
Malaria	139	4	110		78	
Measles	16		45		29	
Meningococcus meningitis					2	2
Mumps	45		26		17	
Paratyphoid fever					1	
Pneumonia		17		22		14
Relapsing fever	1				1	
Scarlet fever	3		2		2	
Tuberculosis		35		30		37
Typhoid fever			4		1	
Whooping cough	[1]2		[1]2		[1]7	

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[1] In Canal Zone only.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for April 29, 1938, pages 685–700. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

Indochina (French).—During the week ended April 30, 1938, cholera was reported in French Indochina as follows: Annam Province, 229 cases; Tonkin Province, 300 cases; Hanoi, 48 cases.

Plague

Bolivia—Santa Cruz Department—Warnes.—During the period March 21–27, 1938, 1 case of pneumonic plague was reported in Warnes, Santa Cruz Department, Bolivia.

Brazil—Pernambuco State—Novo Exu District.—Information dated April 19, 1938, states that 4 deaths from bubonic plague have occurred since March 25, 1938, in Serra da Inveja and Sitio Tramontante in the Novo Exu District, Pernambuco State, Brazil.

Hawaii Territory—Island of Hawaii—Hamakua District—Paauhau Sector.—Three rats found on April 26, 28, and 29, 1938, respectively, in Paauhau Sector, Hamakua District, Island of Hawaii, Hawaii Territory, have been proved positive for plague.

United States.—A report of plague-infected fleas in Clark County, Nev., and a plague-infected squirrel and plague-infected fleas in Baker County, Oreg., appears on page 825 of this issue of PUBLIC HEALTH REPORTS.

Typhus Fever

Bolivia.—Typhus fever has been reported in Bolivia as follows: La Paz, La Paz Department, March 21–April 3, 2 cases; Oruro, Oruro Department, March 21–April 3, 2 cases; Department of Potosi—Potosi, March 21–27, 1 case; Quijarro, March 21–27, 1 case.

Yellow Fever

Brazil.—Yellow fever has been reported in Brazil as follows: Minas Geraes State, March 23 to April 10, 1938, 3 deaths; Rio de Janeiro State, April 6 to 15, 2 deaths; Santa Catharina State, April 3–12, 8 deaths; Sao Paulo State, March 13–29, 3 deaths.

Colombia—Cundinamarca Department.—Yellow fever has been reported in Cundinamarca Department, Colombia, as follows: Caparrapi, March 22, 1938, 1 death; Yacopi, February 22, 1938, 1 death.

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UNITED STATES TREASURY DEPARTMENT

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IN THIS ISSUE

Preliminary Experimental Studies on Blood Coagulation
Age of Delinquents in Relation to Rorschach Test Scores
Mental Defectives and Epileptics in Institutions, 1936

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UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg. Gen. ROBERT OLESEN, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

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PUBLIC HEALTH REPORTS

VOL. 53 MAY 27, 1938 NO. 21

STUDIES ON BLOOD COAGULATION

I. GENERAL CONSIDERATIONS

By LASZLO DETRE, *Senior Immunologist, United States Public Health Service*

INTRODUCTION

Despite the enormous amount of effort devoted to various questions of blood coagulation, one is far from understanding its intrinsic phenomena. The main hindrances to mutual agreement are (1) that there has been no common understanding as to the nomenclature of the substances which enter into reaction; (2) that basic findings, easy to duplicate, were forgotten, and had to be practically "rediscovered"; (3) and that many experiments have never been repeated by critically minded workers, thus leaving an uncertainty as to whether they are reliable. The greatest hindrance, however, is found in the fact that in trying to satisfy the exigencies of the chemical doctrine, most workers emphasize the necessity of working with purified or allegedly pure substances, isolated by various methods from blood plasma and serum. In reproducing the phenomena of coagulation, oftentimes in crude ways, these workers believe that they are justified in neglecting the coagulation phenomena in the unchanged blood. It must be emphasized that we have no proof that fibrinogen as a *detached* chemical unit exists in the blood, that the known and amply studied substance called "thrombin" is in reality the coagulating agent, or even that the "thrombins" isolated by various workers are identical. We have no certain knowledge about the normal anticoagulants, no conclusive chemical evidence of the happenings in the so-called first phase of coagulation (formation of thrombin), no real conception of the role of calcium (except its importance), no valid explanation for the effect of lipin compounds or tissue (platelet) derivatives. Even the mode of action of actively coagulative substances on the coagulable menstruum is unknown.

For those upholding the theory that blood proteins are constituted by a mosaic of separate entities—as albumin, fibrinogen, and the various globulins—the explanation is simple. They accept the theory that in the first phase of coagulation thrombin forms by interaction of preformed so-called prothrombin and calcium, and that this thrombin combines with fibrinogen to form fibrin. Among these workers may be mentioned Howell, Wadsworth, the Maltaners, Eagle, Quick, and Ferguson, in this country, and Bordet, Gratia, Fuchs, Fonio, Fuld, and Morawitz, in Europe, and, of course, such pathfinders as Schmidt, Arthus, and Hammarsten.

However, a number of workers who are just as reliable claim that the attempts at isolation of the real active factors are more or less futile. For them the supposedly isolated factors are artificial products, products of cleavage, corresponding not to the natural mosaic stones of the "live" blood, but rather to the methods employed. The leaders of this group are Pickering, Mills, Hekma, Stuber, A. Fischer, and Nolf. Their theories differ from the accepted one.

The research in blood coagulation needs new points of view and new methods. In this paper an attempt is made to contribute to these needs.

EXPERIMENTAL WORK

The greatest obstacle to the experimental study of blood coagulation lies in the rapidity of this phenomenon. As methods of approach, various workers have adopted rather similar schemes. They have used, chiefly—

(1) Methods which hinder spontaneous clotting (use of paraffined canules and containers);

(2) Plasmas of birds or cold-blooded animals, which show retarded clotting (Delejenne's "bird-plasma");

(3) Mammalian plasma rendered incoagulable by the addition of (*a*) Na, K, NH_4, etc., salts; (*b*) oxalate, citrate, fluoride; (*c*) hirudin, heparin, and like substances;

(4) Plasma gained after intravenous injection of peptone ("peptone plasma") or after an anaphylactic shock, both being spontaneously incoagulable;

(5) Fibrinogen, produced by various methods.

The next step was to study the factors which coagulate these stable substrata. It was then found that various factors can be used in order to provoke clotting in the above-listed substances. Oxalated plasma, for instance, can be clotted by "recalcification" (addition of a surplus of Ca) or thrombin. "Deplateletized" oxalate-plasma needs lipoid extracts beside Ca. Peptone-plasma is clotted by CO_2 or glass powder. Heparinized blood can be clotted by appropriate amounts of Ca (the author's experiments).

In acknowledging that these methods have given us all the data for the prevailing theory of coagulation, we realize that no method was known which would allow the study of unaltered blood or plasma of mammals.

Is there a possibility of gaining conclusive evidence by the use of such products as fibrinogen, prothrombin, serozyme, thrombin, heparin, gained by chemical splitting of mammalian blood? We lean toward the conception that all experiments conducted with them are but poor images of natural happenings—the more so because the properties of these substances vary with the methods employed. In order to give some examples, we may mention the fact that many "thrombins" are proved to contain some lipoid factors; that there is no proof that the powerful anticoagulant, isolated by Howell from the liver, called "heparin," is really the physiological factor which prevents coagulation; that Bordet's "prothrombin" is identical with Mellanby's "prothrombin"; or that the different "fibrinogens" are all devoid of interfering substances.

In studying the most important papers on coagulation (Wöhlisch's excellent monograph on this subject (*2*) gives almost 1,000 references), we felt that there was a need for a method which gives the desired data without changing profoundly the chemical constitution of blood.

USE OF DILUTED FULL BLOOD

The question arose of slowing up the process of coagulation. After many experiments we conceived the idea of diluting the blood with physiological saline. In taking the necessary precautions (see below), we made a set-up of 10 percent, 7.5 percent, and 5 percent blood-saline dilutions, and found that, whereas 10 percent human blood coagulates spontaneously within 2 to 6 hours, 7.5 percent blood stays unclotted for about 10 to 12 hours, and 5 percent blood stays unclotted for 2 days when kept in the refrigerator. However, in order to obtain this favorable result, certain measures are necessary. It has been known for a long time that the more intensive the contact between the shed blood and the injured tissue, the quicker the coagulation. Addition of tissue juice to blood is one of the best methods for the acceleration of clotting. These and similar considerations brought about this method, studied for the past three years.

The finger must be cleaned with water, the moisture wiped off with a clean towel until the skin is dry. The finger is then pricked, not too superficially, with an 18-gauge needle, or even larger. The first drop is rejected, then the oozing blood, drop by drop, is collected in a 1-cc pipette, previously rinsed with sterile saline. The calculated amount of blood is then suspended in 19 times the amount of saline. The operation will be successful if the wound yields about 1 cc of blood within 1 minute. Slow bleeding leads to spontaneous coagulation.

COAGULATION OF 5 PERCENT BLOOD BY VARIOUS SUBSTANCES

Let us pipette 0.50 cc of this blood suspension (B. S.) into each of a series of meticulously clean agglutination test tubes. The series is kept at room temperature. The well known phenomenon of sedimentation follows. The clear gap between the surface and the blood cells will increase steadily to about 1 mm in 10 minutes. In about 100 minutes the tube is clarified, the cellular elements being sedimented at the bottom.

To another similar series is added 0.10, 0.05, 0.02, 0.01 cc of any serum, even an old serum. The first tube will coagulate within 10 or 15 minutes, the second within 25 or 30 minutes, the third within 1 hour, and the last either overnight, or not at all. In using fresh (1- to 2-hour old) serum for our experiment, we will see that it acts much more quickly. The titer of fresh serum is a higher one. Table 1 presents in detail the data from one of our experiments:

Table 1.—*Clotting of 5 percent blood by added serum*

Amount of serum added	Clotting time	
	Fresh serum	48-hour old serum
0.05 cc	18 minutes	40 minutes.
0.025 cc	25 minutes	80 minutes.
0.01 cc	80 minutes	Next day.
0.005 cc	6 hours	Next day negative.

Examined serum: Sheep serum.
Examined blood: Human, 5 percent.
Amount of blood: 0.50 cc.

Figure 1 represents another similar experiment (fresh serum).

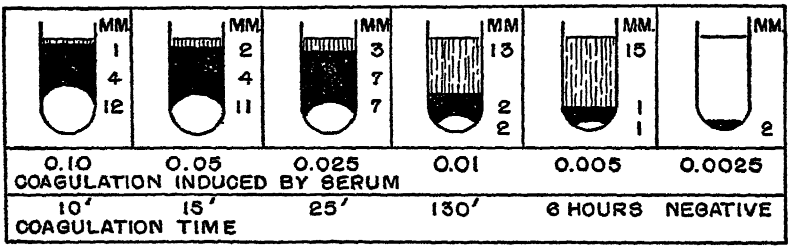


Figure 1.—Coagulation elicited by decreasing amounts of coagulant.

Table 2 shows the effects of "crude thrombin" prepared by the Gamgee-Howell method (extraction of fibrin with 8 percent NaCl) from sheep fibrin:

Table 2.—*Clotting of 5 percent blood (0.5 cc) by crude thrombin*

Added crude thrombin	0.025	0.004	0.0016	0.0008	0.0004	0.00016	0.00008
Clotting time	2 min.+	10 min.+	10 min.+	16 min.+	27 min.+	overnight ±	–

The reaction is a quantitative one.

Table 3 shows the effects of purified thrombin-Howell.

TABLE 3.—*Clotting of 5 percent blood (0 5 cc) by purified thrombin*

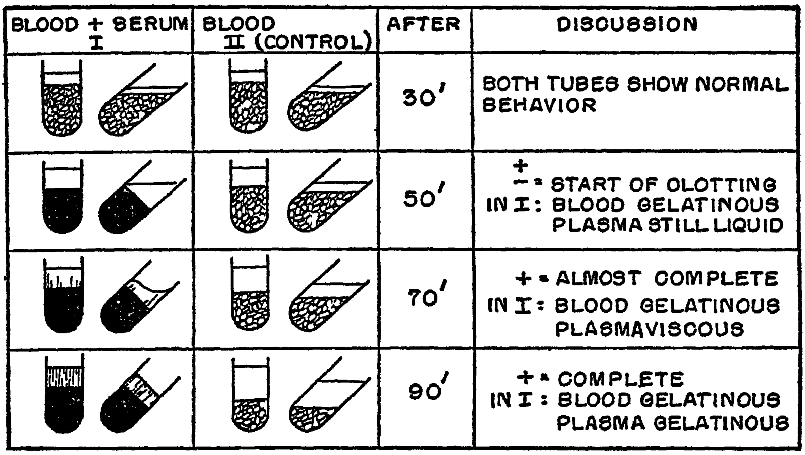
Added purified thrombin	0 0008	0 0004	0 00016	0 00008	0 00004	0 000016
Clotting time	10 min +	10 min +	22 min +	66 min +	180 min +	−

Purified thrombin has a much stronger action than crude thrombin.

DESCRIPTION OF THE CLOTTING PHENOMENON IN A 5 PERCENT BLOOD SUSPENSION

After having found out which amount of serum or thrombin provokes complete clotting within 60 minutes, let us duplicate this mixture and watch the occurrence more closely.

For about 40 to 45 minutes, tubes with and without added serum act alike. In both, sedimentation takes place; both show clear supernatant fluid about 4 mm in depth above the red column.



BLOOD + SERUM I	BLOOD II (CONTROL)	AFTER	DISCUSSION
		30′	BOTH TUBES SHOW NORMAL BEHAVIOR
		50′	± = START OF CLOTTING IN I: BLOOD GELATINOUS PLASMA STILL LIQUID
		70′	+ = ALMOST COMPLETE IN I: BLOOD GELATINOUS PLASMA VISCOUS
		90′	+ = COMPLETE IN I: BLOOD GELATINOUS PLASMA GELATINOUS

FIGURE 2.—Sedimentation in control (II) and automatic registration of coagulation time (I).

The first signs of incipient coagulation manifest themselves at the bottom of the test tube. With a good hand lens we can see a characteristic, weblike structure spreading from the bottom upwards. This movement is easy to recognize even without a hand lens. In tilting the control tube the upper level of the sedimented corpuscular elements will quickly follow the movement of the tube, whereas in the tube with incipient coagulation they will keep their original position. The coagulation will soon reach the clear plasma; filaments will appear, which unite in forming a loose, then a dense web. When the web reaches the upper level, the coagulation is complete.

Note the constancy of blood level in tube I, figure 2, after clotting has started, in contrast to the progressive sedimentation in the control tube, II.

Soon after the coagulation reaches its maximal intensity, the retraction of the clot starts. It begins at the bottom, retracting toward the upper level. Figure 3 shows this process.

As can be seen, the tubes register automatically the time that coagulation occurred. The deeper the level of the clot, the more delayed was the clotting. Sometimes, however, mainly when the coagulation was a very delayed and a weak one, the retracting fibrin fibers lift the clot to the surface, as shown in figure 4.

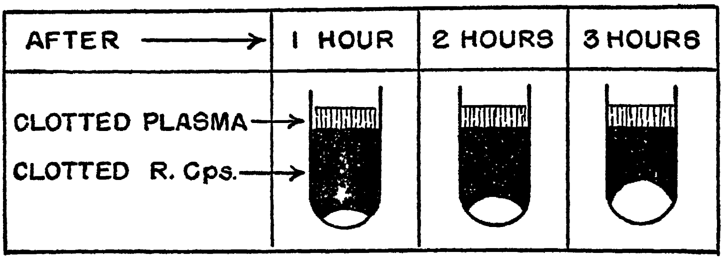


FIGURE 3.—Retraction of clots.

A close observation of these pictures gives many details.

COAGULATION OF PLASMA

Our "plasma" is the supernatant of the centrifuged 5 percent blood suspension. As coagulation goes, it has the same properties as the blood itself. It can be coagulated by the same factors. The coagulation of the plasma does not start at the bottom, but practically the whole tube shows uniformly the subsequent occurrences. The clotting starts with a peculiar opalescent hue of the formerly water-clear liquid; this opalescence progresses later into a faint turbidity, caused by the appearance of the finest granules. Later a "silky" shine indicates the formation of small fibrillae. At this moment the liquid is somewhat viscous; the air bubbles (if present) on the surface move rather sluggishly when the tube is tilted. The viscosity increases, and finally the

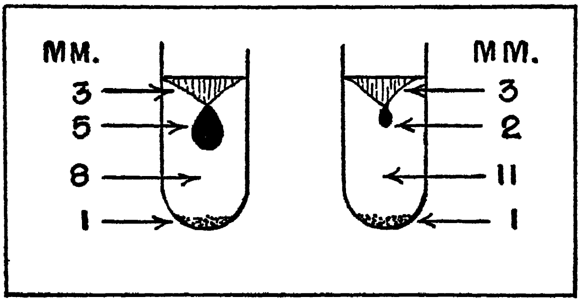


FIGURE 4.—Retraction of clot after delayed coagulation.

content of the tube is gelatinized, indicating the completeness of clotting. We may mention, also, that for the same clotting time, plasma needs two to three times more serum or thrombin than does the blood.

For some special purposes, such as the study of prophases (see below) the use of "plasma" is preferable; but for most tests we prefer the use of whole blood, which, as mentioned, registers details unrecognizable in plasma-clotting.

Time factor, retraction.—It may be mentioned that retraction of clotted plasma is not seen as frequently as in clotted blood. This suggests, as claimed by many authors, the important role played by the corpuscular elements in the retraction phenomenon.

Special experiments were undertaken to determine whether or not the age of the blood sample taken influences the coagulability. It can be shown that immediately after the bleeding the blood is less coagulable than later. The coagulability increases slowly, and reaches its maximum about 1 to 2 hours after the blood is taken. The maximal point once reached, the suspension remains remarkably stable. It can be reexamined after an interval of about 6 to 8 hours, and will give constantly the same titer. This facilitates comparative tests. The increasing coagulability during the first 60 minutes is easily explained by the findings of those who demonstrated the important role of platelet destruction in the first phase of coagulation (thrombin-formation).

COAGULATION OF 5 PERCENT BLOOD BY CALCIUM

The importance of the role played by ionized calcium in coagulation has been long recognized and universally accepted. As early as 1890 Arthus and Paget discovered the anticoagulant power of oxalate, which combines with calcium, forming insoluble calcium oxalate, or sodium citrate and fluoride, which form nonionized calcium compounds. It is also well known that by recalcification, i. e., addition of proper amounts of calcium to oxalated (etc.) plasmas, clotting promptly starts. Those who accept the existence of prothrombin in "live" plasma believe that calcium ions combine with prothrombin, forming the real coagulant, i. e., the thrombin.

Our case is different, however. In our 5 percent blood suspension no essential change could have occurred, the chosen diluent, saline, being practically inert to the blood. (This inoffensive behavior of saline can be shown by using instead of a 5 percent suspension a 10 or 15 percent suspension, which clots spontaneously.) The experiment showed that very minute amounts of calcium have the property of clotting the 5 percent suspension.

This discovery was the result of a curious accident. By an error we were given (as we found later) tap water, labeled "distilled water."

This water specimen, when properly salinized, induced prompt clotting of any collected blood even in 2 to 3 percent suspensions. After the error had been recognized, we easily found that the irregularity was caused by the calcium content of the water used.

Further experiments demonstrated the powerful clotting power of added $CaCl_2$. The experiment of adding 0.01-cc quantities of calcium dilutions to 0.40 cc blood (5 percent) was made. Table 4 shows one of our numerous titrations.

TABLE 4.—*Clotting of 5 percent blood by $CaCl_2$*

(0.01 cc of calcium chloride diluted from 1:25 to 1:4000 added to 0.40 cc blood)

	(a)	(b)	(c)	(d)	(e)	(f)
Added dilutions of $CaCl_2$	1:25	1:250	1:500	1:1000	1:2000	1:4000.
Final concentration of $CaCl_2$ (in mixtures).	1:1000	1:10000	1:20000	1:40000	1:80000	1:160000.
Final concentration of atomic Ca (in mixtures) (calculated on basis of 1 mol. crystal water).	1:3200	1:32000	1:64000	1:128000	1:256000	1:512000.
Clotted within	3–5 minutes.	10–15 minutes.	25–35 minutes.	1–1½ hours	overnight + or ±.	—

The clotting power of calcium is remarkably strong. Knowing that 100 percent blood contains around 1:8000 Ca, our 5 percent blood suspension corresponds to a 1:160000 Ca solution. In adding 1:128000 Ca (column d) or doubling the original Ca content, one is able to induce within 1 to 1½ hours the clotting of the otherwise remarkably stable blood suspension.

In view of the stable nature of the calcium solution, we recommend for all wishing to duplicate our experiments that they undertake first the study of calcium-induced coagulation before attacking the problems connected with serum or thrombin-induced clotting.

ANALYSIS OF THE COAGULATION WITH HELP OF COLLOIDAL FACTORS

The analysis of coagulation with the help of colloidal factors is basically new; it has never been attempted before.

A casual observation led us toward this new field of research. In a short paper published by the author (*9*) it was shown that a typhoid extract to which is added a small amount of typhoid antiserum and a drop of 1 percent India ink gives origin within a few minutes to the formation of large, black flocculi. This so-called India-ink phenomenon is explained by the surface action of the colloidal carbon suspension, which renders visible the otherwise invisible or subvisible reaction between typhoid flagellar substance (H substance) and H agglutinins.

INDIA INK REACTION

Seeing a possibility of working out a rapid bed-side diagnosis by using the India ink as a possible accentuating factor, we collected blood of a typhoid-immunized rabbit, in saline, and added to it a typhoid culture and ink. We witnessed a rapid clumping of the added India ink. Further work showed, however, that this clumping has nothing to do with the immune reaction, described as the India-ink phenomenon, as any freshly taken blood gives the reaction shortly after the addition of India ink. It was found subsequently that the reaction is connected with the clotting of blood. As long as the blood-suspension is unclotted, no change is visible; but when coagulation occurs, the reaction is highly developed. The observation that aged serums show but faintly the power of ink clotting necessitated the systematic study of the hitherto unknown reaction.

We arrived at the following conclusions, which will be discussed in detail below:

At a considerable time before visible coagulation starts, the plasma of the examined blood sample acquires the faculty of precipitating India ink. This power increases steadily until it reaches its maximal point, shortly before visible coagulation occurs. From this point on, there is a steady decline in the reaction capacity of the blood. The serum formed around the clot continues to react for a varied period of time, but the reactions become weaker and disappear almost completely.

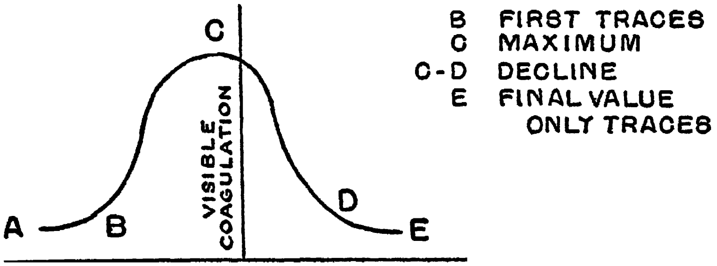


FIGURE 5.—Schematic curve of the ink reaction of coagulating blood.

Several additional facts elucidated the nature of this reaction. It was found at first that spontaneous coagulation (for instance, of a 10 to 15 percent blood suspension) and coagulation induced by serum or thrombin preparations act alike. In all cases, the curve shown in figure 5 could be obtained.

The reaction may be studied as follows: Add enough calcium, serum, or thrombin to a 5 percent blood suspension to provoke a coagulation within, say, 1 hour.

Let us remove every 10 minutes 0.10 cc of the clarifying blood plasma, add it to 0.3 cc saline, and add 1 drop (about 0.03 cc) of a 1 percent India ink[1] solution in distilled water. The individual mixtures are examined after 5, 10, 30, and 60 minutes, and so on.

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[1] Higgins' ink was used.

The following tabulation shows the result of one of numerous experiments:

Sample removed:	*Ink reaction*
Immediately	in 60 minutes, −.
After 10 minutes	in 60 minutes, ?
After 20 minutes	in 30 minutes, ±; in 60 minutes, ++.
After 30 minutes	in 5 minutes, ±; 10 minutes, ++; 30 minutes, ++++.
After 40 minutes	in 1 minute, +; 5 minutes, ++++.
After 50 minutes	immediately ("lightning reaction").
After 60 minutes	in 1 minute, +; 5 minutes, ++; 10 minutes, ++++.
Meanwhile coagulation occurs:	
After 70 minutes	in 5 minutes, +; 10 minutes, +++; 50 minutes, ++++.
After 80 minutes	in 10 minutes, +; 60 minutes, +++.
After 100 minutes	in 30 minutes, +; 60 minutes, ++.
After 120 minutes	in 60 minutes, +.
After 3 hours	in 60 minutes, ? or −.

PROPHASE AND METAPHASE

Visible coagulation is preceded by a "prophase," characterized by the formation of ink-reacting properties, and succeeded by a "metaphase" characterized by the steady decline of this power (see fig. 6).

Further analysis showed that the shorter the interval between the addition of clotting factor and the provoked coagulation, the nearer the maximum of ink reaction to the visible clotting, and the shorter the duration of the ink power. In other words, the speedier the clotting, the shorter both the ink prophase and ink metaphase. In some cases, for instance, in using as clotting factor 1:1000 to 1:4000 Ca, the two phases mentioned are recognized only upon using special precautions. On the other hand, in prolonging coagulation time for 2 or 3 hours one has ample opportunity for the demonstration of the described phenomenon.

PROLONGING COAGULATION TIME

There are several ways of prolonging coagulation time. One of them, already mentioned, consists of adding small amounts of any of the clotting factors (Ca, serum, thrombin) to the coagulable substances. We may add still more methods, all perfectly suited for the production of what we may call the "slow motion picture" of coagulation. These are as follows:

(*a*) Increase of the NaCl content of the blood to 2 or 3 percent;
(*b*) Addition of other salts in proper amounts (K, Cl, LiCl, ammonium chloride, ammonium sulfate);
(*c*) Addition of "sub-active" doses of hirudin or heparin.

With all these methods it was shown that there is a phase of rather long duration, 1 to 2 hours, in which the examined plasma does not give any trace of coagulation, but gives what we call the "indicative" ink reaction.

In order to understand this reaction, it seemed advisable to study, as to their reaction toward ink, all the ingredients of the mixtures destined to coagulate later. These studies gave rather interesting results.

Let us consider first the blood. (1) After centrifuging the unclotted plasma of the control blood used, and adding to 0.40 cc of this 1 drop of ink solution, no reaction occurs. (2) Crude thrombin and purified thrombin are both ink-inactive. (3) Serum used as thrombic factor: In our usual experiments, we add 0.05 or 0.03 cc of serum to 0.40 cc blood. The serum is therefore diluted 9 to 14 fold. It can be shown that this dilution (in saline) is ink-inactive.

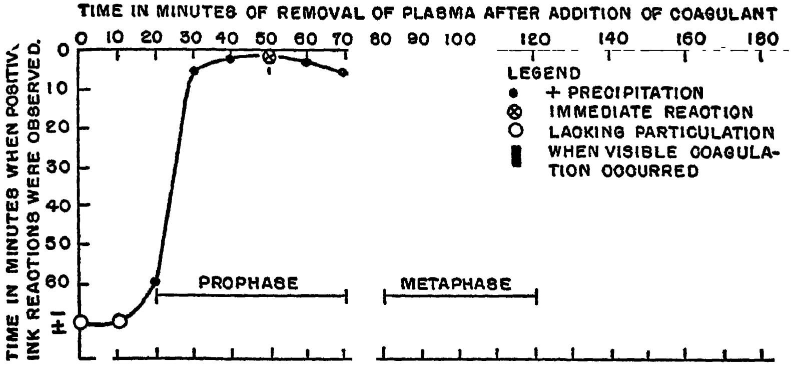

FIGURE 6.—Detailed curve of ink reaction of blood.

CALCIUM USED AS CLOTTING FACTOR

Calcium is a potent ink-precipitating agent, as shown in table 5. The method employed was as follows: To a set-up of $CaCl_2$ dilutions, in saline, is added 1 drop of 1 percent of India ink. Reading is made after 2 hours.

TABLE 5.—*Precipitation of India ink by $CaCl_2$*

$CaCl_2$ dilutions	1:100	1:200	1:400	1:800	1:1600
				+	−
Results	Full clarification	Same	Incomplete, liquid is somewhat smoky.	Smallest granules.	Liquid: Brown.
	Largest black clumps.		Large granules.	Liquid: Brown.	No particulation.

In comparing the slight (+) flocculation elicited by 1:800 Ca with the complete sedimentation within 1 to 2 minutes produced in coagulable blood by previously added 1:10000 or 1:20000 Ca, there can be no doubt that the two phenomena have no connection whatever. We have direct proof for this view.

Further experiments show that the direct ink-precipitating effect of calcium is abolished by the addition of as little as 1 percent of serum.

Experiment: To 1 cc of 1:400 dilution (in saline) of $CaCl_2$ are added increasing quantities of any serum. Then 1 drop of ink is added.

Reading, after 2 hours, is as follows:

TABLE 6.—*Hindrance of ink-precipitating effects of Ca by addition of serum*

	Quantity of serum					
1 cc of 1:400 $CaCl_2$ added to	0 03	0.02	0.01	0.005	0.002	0 (Control)
Ink reaction	–	–	–	±	+	++++

In considering that our 5 percent blood samples correspond to a serum (or plasma) solution of 3 percent, we see that there is three times more serum present than necessary to prevent the direct Ca effect on ink. (It should be mentioned that the graphical analysis of the protecting power of serum showed that serum acts as a "protective colloid.")

THE INDICATIVE INK REACTION

We feel justified in believing that our "indicative ink reaction" is not caused by any of the ingredients used, but that it indicates changes occurring by the interaction of the formerly ink-inactive substances during coagulation.

Let us analyze the phenomenon as it presents itself in the prophase or metaphase of coagulation. We have noted that, long before coagulation occurs, the aliquot parts of the clear plasma removed gave a reaction with ink. Great difficulties were encountered in explaining this phenomenon. Our first and obvious explanation was that the "thrombin," formed through the interaction of calcium and prothrombin, must be the ink-active factor. The ink analysis of both "crude thrombin" and purified "Howell-thrombin" showed, however, that this explanation is incorrect. Both thrombins are absolutely inactive toward ink.

"Lightning reaction."—Close observation of the action a few minutes prior to the expected visible blood clotting leads us to the right path. In the tabulation on page 840 is found the term "lightning reaction."

This term was used to emphasize the extraordinary rapidity of the phenomenon which occurs shortly before visible coagulation starts.

The formerly perfectly translucent liquid becomes, after addition of ink, immediately turbid, and flocculi of a rather fibrillar structure appear; the fibrillae form a large, coal black web; and, finally, a solid black clump of irregular shape, identical with the usual aspect of fibrin, becomes visible. The precipitate formed is nothing but ink-charged fibrin.

Granular and fibrillar fibrin.—At the height of the process, there is evident fibrin formation present; the greater the digression each direction from this point, the less characteristic are the compounds formed. Finally a stage is reached in which only a slowly forming granular precipitate is visible. This granular precipitate, as shown by dilution experiments, must be considered as granular fibrin.

Now a great step has been made toward the explanation of the problem. Fibrin, as we understand its formation, is produced by the interaction of thrombin and fibrinogen. As the final product of the indicative ink reaction is fibrin, the assumption is obvious that the plasma in which the ink elicited the reaction must have contained both the fibrinogen and the thrombin. It is assumed that they are both present and may be in a loose union, in order to coagulate later on.

Experiments showed that assumption to be correct. The presence of fibrinogen was demonstrated by the fact that proper doses of thrombin provoke speedy clotting of the "labile" plasma; the presence of thrombin, or, speaking more generally, of "coagulative substances," by the ability of the removed plasma samples to provoke clotting in a second blood sample.

In pursuing this direction of research further, we succeeded even in determining, in a crude mathematical way, the amount of clotting substances in the ink-positive stage of blood specimens later to coagulate.

In order to correlate the intensity of the indicative ink reaction with the intensity of clotting power, we proceeded in the following way: Two series of test tubes were prepared; one series contained 0.40 cc of saline and one drop of India ink; the other series contained 0.25 cc of 5 percent blood. Then 0.25 cc of a human serum was added to 5 cc of 5 percent plasma, previously proved to possess normal coagulability. From time to time 0.2 cc of this plasma-serum mixture was removed and 0.10 cc of it was added to the ink tube, and the same quantity to the 5 percent blood tube. The results were as follows: The ink series gave the expected curve of reaction. The blood series gave a duplicate of the curve, showing that the ink-reacting and clotting substances develop in close harmony.

Analogy to immune ink reaction.—There can be no doubt that the coagulation can be divided into two phases. In the first phase the interacting substances are present without giving evidence of their presence by any signs of coagulation; in the second phase the coagulation becomes manifest. In the first phase, their presence can be shown by our indicative ink reaction, which seems to be a perfect replica of the immune ink reaction. Two substances having affinity for each other form an invisible reaction, which is rendered visible by the catalytic surface activity of a potent colloidal agent, i. e., the ink. In the case of the immune reaction, the two interacting substances are the floccular antigens and their respective antibodies; whereas in the prophase or metaphase of coagulation, the two interacting substances are the fibrinogen and the clotting principle.

Thrombin and calcium formative agents of real coagulant.—In this summary the universally used term "thrombin" is avoided; and some explanation of this point is necessary.

In inducing coagulation in 5 percent blood with calcium alone, there seems to be no possible objection to the accepted idea of thrombin formation through interaction of the normally present "prothrombin" with calcium. But the case is different when coagulation is induced with thrombin. Plasma or blood treated with thrombin are at first ink-inactive and unable to provoke secondary coagulation. Both of these faculties develop only after a certain time and reach their maximum shortly before visible coagulation is shown. The complete parallelism of calcium and thrombin effects can be explained only in one way: Neither one is the real coagulant; on the contrary, the real coagulant is a product of their interaction on the unclotted blood. We gathered enough evidence by analyzing the interaction of calcium on 56°-heated plasma (see below) in order to assume that what we call "thrombin" is but the precursor, or causative agent, of a process which leads to the formation of the real, until now unknown, coagulant. (Strictly speaking we are not even entitled to characterize this coagulant factor as a definite "substance." Some considerations lead to the theory that the coagulant "factor" is in reality a coagulant "state.")

"LIQUID" FIBRIN

We arrived at the conclusion that during both the prophase and the metaphase of coagulation there must exist a special phase of fibrin which we may call "liquid" fibrin. We use this term to designate a substance which is fully equivalent to the well-known fibrin, with the only exception that it is not coagulated. It offers a complete analogy to many immunological phenomena, for instance, to the invisible agglutination, first described by Bordet and Nolf. The agglutination, as is known, needs 3 (not 2) reacting substances—the antigen, the antibody, and the electrolytes. In the absence of this third component, the agglutination is not manifest. Antigen and antibody are united, but the formed compound stays in solution and changes to a particulate (precipitated) stage only when it is given the minimal amount of salt. In the stage of "liquid" fibrin the stage of particulation is not reached, probably on account of special quantitative hindrances.

The study of "liquid" fibrin is still in its embryonic stage. Especially, the question whether the two substances which are the essential components of liquid fibrin (fibrinogen and the newly formed "coagulant") are or are not bound, could not be solved to a satisfactory degree.

CONTROVERSIAL ISSUES

Using our two new methods (use of a diluted blood suspension, and use of India ink), some research work was undertaken in order to have a clearer insight into controversial issues. They are enumerated in the order in which they were studied.

Substitution of other colloids for ink.—In order to ascertain whether any constituent of the India ink suspension or the colloidal state of this reagent plays the important role of rendering visible a still invisible coagulation, we attempted to substitute other colloids for India ink. The best results were obtained with a colloidal suspension made by diluting an alcoholic solution of resin in 0.1- to 0.2-percent saline. All essential features of the ink reaction could be duplicated; for instance, the granular reaction in the prophase, the fibrinous "lightning reaction" shortly before visible coagulation occurs, the late granular reaction of the metaphase, etc. However, for practical reasons, we prefer ink to resin.

Electrolytes.—The hindering influence of an excess of electrolytes on coagulation can be easily demonstrated and studied. Very interesting curves were plotted in comparing the hindering power of different salts, and in studying their mutual antagonism.

Influence of suspended particulate matter.—The accelerating influence of suspended organic and inorganic particles on the speed of coagulation is a phenomenon that many workers have studied. They compare it with the almost instantaneous crystallization induced in oversaturated salt solutions by the addition of tiny crystals, which act as centers of crystallization. The sudden freezing of overchilled water when a small piece of ice is added is a similar phenomenon. The spontaneous clotting of (otherwise noncoagulant) peptone plasma by shaking it with glass powder is the paradigm of this phenomenon.

We studied this question first by preparing underclotting mixtures (or "liquid fibrin") and adding to the clear plasmas various quantities of typhoid suspensions. The accelerating power of these suspensions was easily demonstrated.

In order to show the importance of the active surface in a second series, agglutinated typhoid suspensions were added to the "liquid" fibrin. It was shown that their accelerating power was greatly lessened. Appropriate controls made it clear that the reduction of surface (caused by agglutination) is responsible for this very evident difference between finely dispersed and agglomerated bacilli.

Analysis of the action of heparin.—Heparin is the powerful anticoagulant isolated and analyzed by its discoverer, H. W. Howell. This investigator showed that heparin has to be considered as an antiprothrombin because it hinders the conversion of prothrombin into thrombin. He advanced the theory that heparin, considered by him as the physiological anticoagulant of live blood, combines in shed blood with the lipoidal tissue factor, or platelet factor, so essential for the formation of thrombin, and is thereby rendered inactive. Our experiments gave another explanation for the anticoagulant power of heparin.

By the aid of our method it was constantly shown that heparin acts as an anticalcium factor. It combines in constant proportions with $CaCl_2$. The compound (heparin+Ca) has then lost its power of inducing coagulation, being precipitated somewhat similarly as is oxalate-calcium. This unexpected finding was shown in demonstrating that—

(*a*) A coagulating dose of Ca could be overcompensated by previous addition of heparin to blood, or to the Ca solution.

(*b*) A coagulation preventing dose of heparin could be overcome by increasing the quantity of added calcium.

(*c*) The amount of heparin necessary to neutralize calcium, or of calcium to neutralize heparin, is remarkably stable and follows almost stoichiometric laws. It was found that 1 part of $CaCl_2$ is neutralized by 1:10 heparin (or 1 heparin by 10 Ca). For instance, 0.01 of $\frac{CaCl_2}{1000}$ was neutralized by 0.01 $\frac{\text{heparin}}{10000}$.

(*d*) What we emphasize especially is the fact that the same neutralizing ratio of 1:10 was also found for other Ca reactions. For instance, in order to hinder the ink-precipitant power of calcium, the same ratio of heparin was found effective as the ratio fitted to hinder the blood coagulative power of the same calcium solution.

Data about hirudin.—Hirudin, the anticoagulant extracted from leeches, is considered by most workers as a typical "antithrombin." It is supposed to neutralize thrombin already formed. However, with our method it was found that it neutralizes the clotting power of calcium and is, conversely, neutralized by calcium. The theory, first advanced by Gratia (*5*), that hirudin interferes with coagulation in any phase of the clotting process, found an experimental explanation.

Oxalate.—In precipitating calcium, oxalate renders freshly shed blood incoagulable. Oxalated blood or plasma, however, is promptly clotted not only by adequate doses of calcium but also by thrombin. It is generally assumed that oxalate is unable to combine with the calcium already forming a part of the thrombin molecule.

A thorough analysis of oxalate activity indicated that the old view must be reconsidered. In fact, our studies demonstrated that weak coagulants, as present for example in 56°-heated serum, can be rendered ineffective by previous addition of a quantity of oxalate which would not prevent clotting when added to the blood to be clotted. This result was obtained in comparing the anticoagulant power of oxalate on equipotent solutions of $CaCl_2$, 56°-heated rabbit serum, and unheated rabbit serum.

Our experiments indicate that in a previously oxalated blood menstruum, fibrinogen combines readily with the coagulant added; in other words, coagulation occurs *before* oxalate interacts with the coagulant, whereas if the same amount of oxalate is added to the coagulants examined after a certain time (1 to 1½ hours) they are decalcified by oxalate and rendered inactive. Widely divergent observations of different authors as to oxalate become easily explained. It might be stated that, by our methods, we could show that the coagulant power of serum is the result of two agents, viz, residual "thrombin" and calcium. The older the serum, the weaker the thrombin factor, the calcium being practically unchanged. In inactivated (30-minute, 56°-) serum, the coagulant power is greatly reduced as compared with the same unheated serum.

Heated fibrinogen.—It is known that a very short (5-minute) heating of blood or fibrinogen destroys the faculty of being clotted by thrombin. Our methods enabled us to analyze this phenomenon. We reached the following conclusions:

(*a*) The centrifuged plasma of 5-percent blood after a short (5–10-minute) heating to 56° loses the faculty of being clotted by Ca, serum, or thrombin.

(*b*) 56°-heated plasma becomes opalescent. This faint turbidity can be removed by centrifuging.

(*c*) The centrifugates can be reemulsified in saline without entering into solution.

(*d*) Upon addition of active serum or calcium, the suspension shows slight clumping not unlike agglutination, but does not coagulate.

(*e*) Nevertheless the ambient fluid removed after 60 to 90 minutes gives evidence of two newly acquired qualities, viz, it gives a powerful indicative ink reaction, and provokes coagulation when added to coagulable blood. It was shown, therefore, that the precipitate of heated plasma acts like unheated plasma, with the only exception that it does not coagulate. Under the influence of calcium, it produces ink-positive and coagulant substances just as does normal plasma.

SOME REFLECTIONS ABOUT ANTICOAGULANT FACTORS OF CIRCULATING BLOOD

In possession of methods giving us almost mathematical results, an attempt was made to understand conditions in nature. Let us assume that, by any of the known pathological conditions (trauma, bacterial infections affecting the walls of capillaries, bacterial emboli, defects in circulation, etc.), thrombin is released. In view of the fact that, during coagulation, new thrombin is formed or released, it is difficult to understand why coagulation, after its onset in any part of the organism, does not advance to lethal proportions. Rather simple quantitative considerations will give the proper explanation.

Coagulation is a strictly quantitative process.—Coagulation depends only on the amount of added clotting factor (Ca, serum, thrombin) whether we shall witness an instantaneous, a speedy, a normal, a delayed, or a negative coagulation. In analyzing these negative effects, it can be shown with the ink method that slight amounts of ink-active substances are formed even in these apparently "negative" mixtures, but the process evidently does not ripen to such an intensity as to provoke clotting.

Dilution with saline.—By dilution of 5 percent blood with a noncoagulable menstruum, saline, for instance, it was shown that greater dilutions need greater quantities of calcium. In plotting the observed data by Cartesian coordinates, curves of parabolic character were obtained. (See fig. 7.)

In diluting 5 percent blood twice, we need two times as much Ca for the 60-minute clotting. More than four times as much Ca is needed for the 60 minute coagulation of a 1.25 percent blood suspension as with the routine 5 percent suspension.

Dilution with plasma.—By dilution of our 5 percent blood with a coagulable menstruum, diluted plasma, for instance, the problem is an additional one. If blood needs n Ca, and plasma m Ca, then the results are

1 blood+1 plasma$=n+m$
1 blood+2 plasma$=n+2m$
1 blood+4 plasma$=n+4m$
1 blood+x plasma$=n+xm$

Plotted graphically, the results are characterized by a straight line which is broken near the starting point (fig. 8).

By adding 5 percent blood to 5 percent blood, an unbroken straight line is obtained, as the expression of straight quantitative conditions. In interpreting the curves in words, we may make the rather obvious statement that the amount of thrombin fitted to coagulate a certain amount of blood does not suffice for clotting either the same amount diluted, or multiples of the same amount. The first case occurs only under experimental conditions; the second is the one which occurs normally.

Fibrinogen as protective anticoagulant of blood.—What is the normal anticoagulant of blood which renders inactive the thrombin already present? It is the fibrinogen itself. This protective influence of circulating fibrinogen becomes possible only and exclusively (*a*) by the affinity existing between fibrinogen and the clotting factor; (*b*) by the fact that determined minimal amounts of clotting factors are necessary in order to provoke clotting; (*c*) by the fact that "sub-clotting" quantities combine with fibrinogen and may even elicit the formation of ink-active principles, but they do not manifest themselves in provoking visible coagulation.

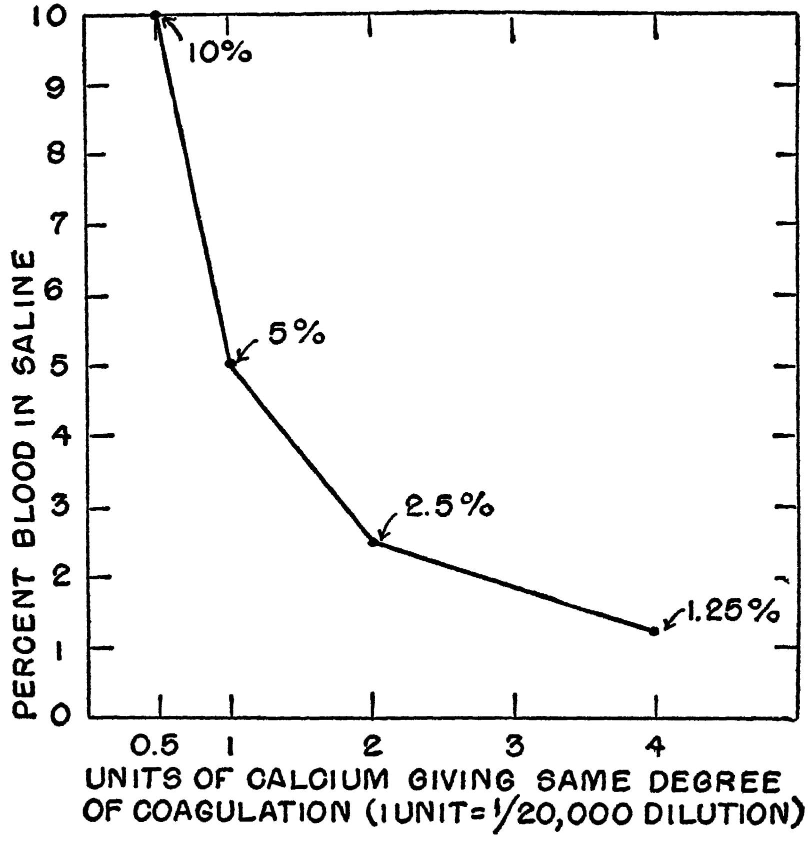

FIGURE 7.—Titers of blood dilution.

Experimental proof.—A very simple experiment demonstrates the correctness of this view. If the normal protective substance is the same one which is coagulable, then we are able to protect our 5 percent blood against any studied clotting factor by letting it act on a small portion of the coagulable menstruum. The clot formed on the contact zone will protect the remainder of the blood. We stratified, in the ordinary precipitation tubes, 5 percent blood with a solution of such a percentage of calcium which, when mixed with the total amount examined, would provoke clotting within 60 minutes (1:40000 final concentration of $CaCl_2$ would be sufficient).

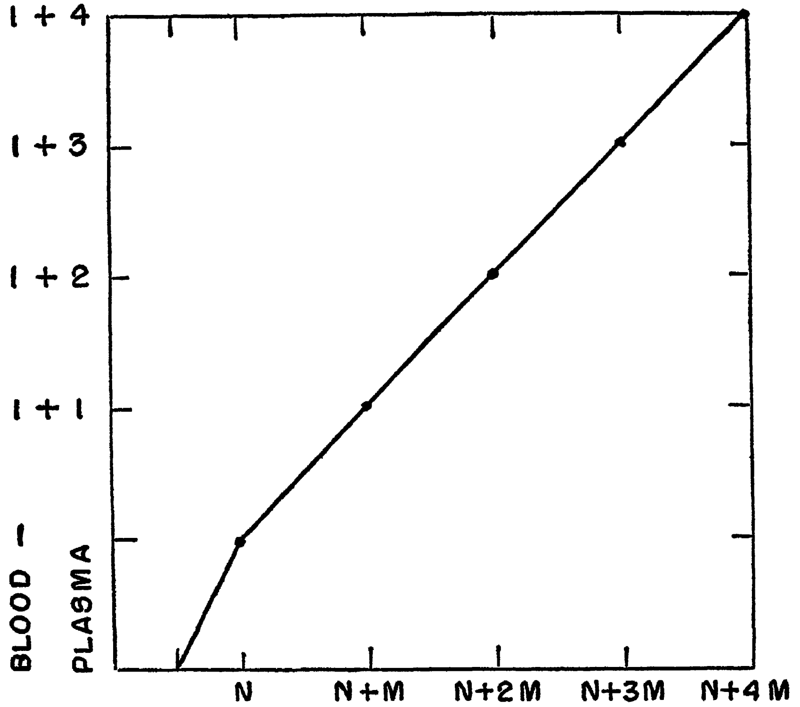

FIGURE 8.—Ca titers of blood diluted with plasma.

After 60 minutes, the control tube (mixed) showed +coagulation; the stratified tube showed + + + coagulation at the contact zone, but does not show coagulation elsewhere.

This important experiment was varied in several ways (use of Petri dishes, use of capillary tubes) and gave consistently the same results. The thrombic factor was rendered ineffective by the interaction of the two substances present at the level of contact. The phenomena of clotting occurring in the live organism can be easily explained.

CONDITIONS IN THE ORGANISM

Cut or bruised wound.—Thrombin forms by the interaction of the tissue factors and shed blood. This blood is removed from the circulation. It clots promptly. The thrombin is rendered inactive by its combination with the coagulable factors.

Parietal thrombus.—Due to pathological influence, the coating intima is damaged; there are possibilities of thrombin formation. The external surface of the thrombus formed is not in contact with the circulation. The internal surface is in contact with circulating blood. Thrombin is taken up by the blood and rendered inactive. (See A, fig. 9.)

The intensifying influence on intravascular clotting by slowing up of the circulation.—Thrombin acts on fibrinogen locally before it can be removed and rendered inactive.

The old observation of clotting not passing the next bifurcation is easily explained.—The clot is surrounded by stagnant blood, which will clot slowly but surely. The moment the clot reaches the area of steady circulation, clotting stops, the physiological anticlotting factors entering into action. (See B, fig. 9.)

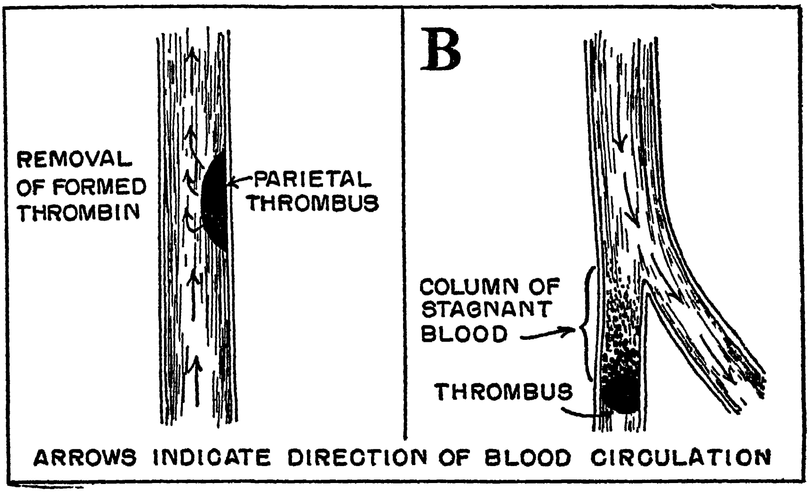
B
REMOVAL OF FORMED THROMBIN
PARIETAL THROMBUS
COLUMN OF STAGNANT BLOOD
THROMBUS
ARROWS INDICATE DIRECTION OF BLOOD CIRCULATION

FIGURE 9.—The relation of a thrombus to the circulating blood.

The formation of pyramid shaped infarcts in any area supplied by end arteries and the various examples of localized thrombosis find an obvious explanation. In short, the quantitative conception of the coagulation process plays the determining role in the explanation of localized clotting. The safeguarding of the organism menaced by locally formed clotting factors is the result of the quantitative relationship existing between coagulable and coagulant compounds.

SUMMARY

Experiments are reported which, it is believed, must lead to a reconsideration of current theories regarding the mechanism of blood clotting. Two original techniques were employed: One consisted of dilution with saline for delaying reactions sufficiently for the purposes of study. The other was the employment of colloidal India ink as a sensitive detector. Evidence is adduced to show that whether clotting occurs or not depends upon quantitative relations among the reagents. The role of a new substance, to which the name "soluble fibrin" has been assigned, is discussed.

REFERENCES

(A great number of papers were reviewed, but reference is made here only to some selected works which may be of especial use to those interested in this subject. Reference is made to some of these in the text.)

(*1*) Howell, W. H.: A text book on physiology. Saunders, 1927. (Gives a clear outline of the views of this well-known author.)

(*2*) Wöhlisch, E.: Die Physiologie und Pathologie der Blutgerinnung. Ergebn. d. Physiol., **28**: 443–624 (1929). (Gives an excellent and complete review of the subject with special reference to the findings of the older pathfinders.)

(*3*) Pickering, J. W.: The blood plasma in health and disease. Macmillan, 1928. (The author gives evidences of many weaknesses in the accepted theories.)

(*4*) Nolf, P.: Eine neue Theorie der Blutgerinnung. Ergebn. d. inn. Med., **9**: 275–341 (1912). (The author is one of the foremost authorities among the "heretics.")

(*5*) Gratia, A.: Le mecanisme des actions anticoagulants. Ann. de l'Inst. Pasteur, **35**: 513 (August 1921). (A fine attempt to solve the problem of some anticoagulants.)

(*6*) Bordet, J.: Considérations sur les théories de la coagulation du sang. Ann. de l'Inst. Pasteur, **34**: 561–595 (1920). (A summary of many facts revealed with help of new methods.)

(*7*) Fuchs, H. J.: Eine neue Theorie über die Blutgerinnung. Kl. Woch., **9**: 243–245 (Feb. 8, 1930). (Critique of the prevailing theories.)

(*8*) Eagle, Harry: Recent advances in the blood coagulation problem. Medicine, **16**: 95–138 (1937). (A good critical review of the problems, with special reference to the author's personal observations and papers. Good references about newer contributions.)

(*9*) Detre, Laszlo: (a.) The India ink reaction. J. Bact., **31**: 67 (January 1936). (b.) Purification of Vi-type *B. typhosus* strains. J. Infect. Dis., **60**: 319–334 (May–June 1937). (Gives a brief summary about the use of India ink for detection of both invisible and subvisible agglutination.)

AGE OF DELINQUENTS IN RELATIONSHIP TO RORSCHACH TEST SCORES

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The Rorschach Ink-blot Test has received so much attention in the literature as an approach to the study of personality that the author was intrigued by the possibility of using it as a routine procedure in studying the mental make-up of delinquent individuals. Incidentally, experimentation might also reveal whether it is really a test or merely a crystal ball in which the examiner may read whatever he wants to believe about his patient. With these ideas in mind an investigation was inaugurated dealing with the relationship of various factors to the Rorschach Test. The present article is concerned principally with the age factor. The influence of age on Rorschach scores of nondelinquent individuals, chiefly children and adolescents, has been studied by a number of investigators with equivocal results. Hertz, after summarizing the views of Rorschach, Behn-Eschenburg, Loosli-Usteri, Löpfe, Mira, and Linares, concludes that the influence of age upon Rorschach scores has not been adequately and statistically verified (*1*).

THE SUBJECTS

The test was given to 500 prisoners who had been admitted to the United States Northeastern Penitentiary during the 11 months' period from July 1, 1935, to June 1, 1936. The subjects were chosen at random to get as fair a sampling of the institutional population as possible. Later it was found necessary to discard 24 of the completed tests because certain information was lacking about the persons taking the examinations in question. For this reason all the statistical analyses were based on 476 cases, except for the computation of common response scores, for which purpose the original group of 500 was used.

Combining all medians, averages, and highest frequencies, and leaving out awkward decimal places, a composite individual representing the group of 476 final selections would be a 33-year old married man, from the Northeastern section of the United States, who had been sentenced for passing counterfeit money. He would be a native-born, unskilled laborer, who quit school when he was about half-way through the eighth grade. He would come from a home unbroken by the death or separation of his parents, and would exhibit a mild psychopathic trend. He would have an athletic body build, a mental age of 14 years, 2 months,[1] an educational grade status (Stanford Achievement) of 6.7, and a score of 12 atypical responses on the Woodworth Personal Data Sheet.

Since this particular report concentrates on the age factor, a more detailed discussion of the age of the selected individuals is necessary. The range was from 17 to 77 years, with an average of 33.4 and a median of 32.7 years. The latter compares quite favorably with the median age of 32.3 recorded for all male admissions to the various Federal penal and correctional institutions for the fiscal year, July 1, 1935, to June 30, 1936 (*2*). Therefore, as far as age is concerned the group selected is fairly representative of all Federal prisoners, with the possible exception of those housed in the two reformatories, where the average age of committed individuals is considerably lower, 25.9 years at the U. S. Industrial Reformatory, Chillicothe, Ohio, for instance (*2*). However, 23.1 percent of the selections were under

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[1] The tests used were Army Alpha and Beta.

25 years of age, and 6.5 percent were 19 years of age, or under. The proportion of younger men is, therefore, sufficient to make comparative observations possible. If any weakness exists, it is more likely to be in the upper extreme, there being only 1.8 percent individuals 60 years of age, or over, hardly sufficient to justify conclusions regarding the effects of senility on Rorschach Test performance. A graphic presentation of the comparative distribution of ages for the male admissions to all institutions and for the test group will be found in figure 1.

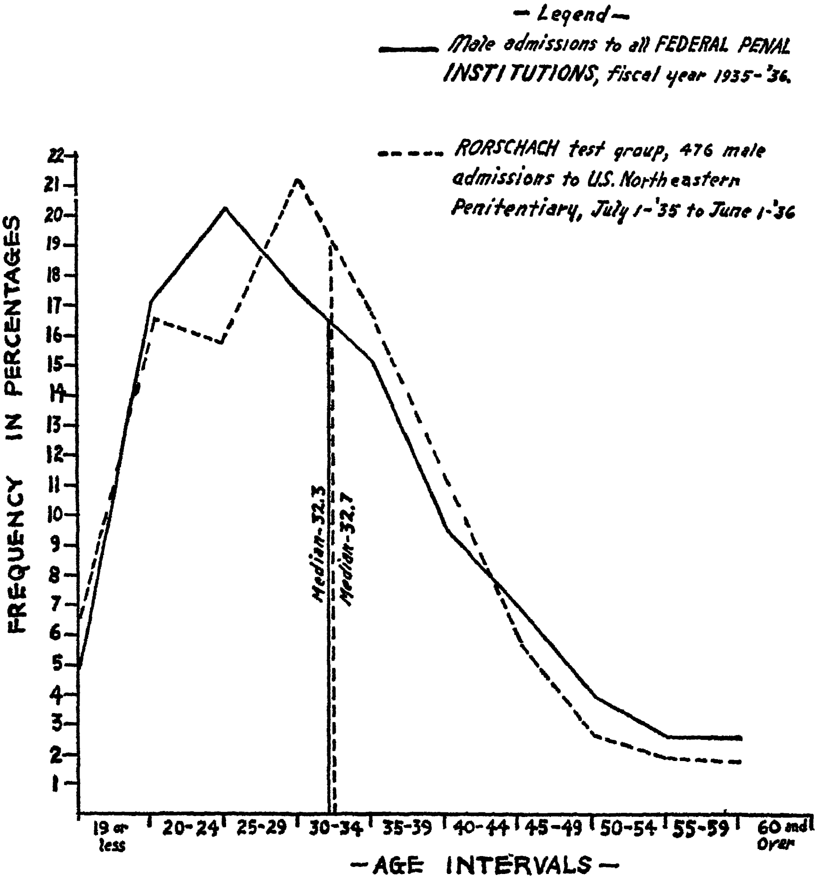

FIGURE 1.—Comparative distribution of ages.

THE PROCEDURE

As the name implies, the Rorschach Test consists of a series of 10 symmetrical ink blots, 5 of which are simple variations of grey and black, 2 have a splotch of red color added, and 3 are multicolored. These cards are shown to the subject, one at a time, with the query, "What do you see? What can it be?" As a general rule there is no limit to the number of responses that may be given, nor to the time taken by the subject for each picture. Lopfe, however, urges a limit of seven responses for each card, and Hertz advocates a time limit of 2 minutes (*1*). The test is easy to administer and rarely fails to arouse the interest of the subject, but it is difficult to score, chiefly because of its reliance upon subjective interpretation. The responses are customarily classified according to the following general categories:

(1) Whether the whole or a part of the figure determines the answer.

(2) Whether shape, color, motion, or combinations of these can be detected as attributes of the response.

(3) Whether the concept is animal, parts of animals, human figures, parts of human figures, landscapes, objects, and so forth.

(4) Whether the reply is original or is frequently given by other individuals.

(5) Whether the subjects see the picture as a whole first and then proceed to details, or vice versa.

(6) Whether general or detail responses alone are given.

In this investigation the Rorschach Test was treated as essentially an association test in which the stimulus is visual and the response verbal. Accordingly, reaction time was considered an important feature of the procedure. The method of administration was standardized as follows:

(1) The subject and examiner were seated opposite each other with the cards placed face down on the desk between them. The cards were arranged in numerical order, with the first card on top, the numerals appearing to the examiner's left in the upper corner on the back of each card. Thus when the card was turned over toward the subject, it would always be right side up for him.

(2) The examiner had before him a mimeographed sheet for recording responses, reaction time, and any other necessary notations. Of course, he also had a pencil with which to do the recording, and a stop watch. It was found most convenient to hold the watch in the left hand, more or less concealing it by resting the hand on the lap under the desk. When the watch was not in use, it could be easily slipped into the left hand coat pocket. As a matter of fact it did not make very much difference where the watch was placed, because the subject soon became aware that he was being timed.

(3) When all arrangements had been made, the subject was given the following explanation: "This is an experiment. It has nothing to do with your record in the institution. It is not a 'bug' test. In fact, you don't have to go through with it, if you don't want to. Do you have any objection?" If the reply was in the negative (very few refused), the examiner then said: "All right, I'm going to show you these cards (pointing to the cards), one at a time. There are 10 of them. On the other side of each is a picture, a figure. When I show it to you, I want you to tell me what you see; what it could be. Tell me the first thing that pops into your mind."

(4) Following these instructions, the first card was turned over toward the subject, face up, and the stop watch started. As soon as the subject gave his first response, the watch was stopped and the time recorded, together with the response. No time was taken on succeeding responses.

(5) The subject was permitted to give as many spontaneous responses as he cared to, but no prompting was given such as, "What else do you see?" When it appeared that no more answers were forthcoming, the examiner said, "All right, let's try the next one." The first card was then removed and the next in the series was exposed, duplicating the conditions of the first, and so on through the whole series.

After 500 examinations had been given, the primary and secondary responses for each card were tabulated in the order of frequency, using only the key words. For example, if the answer was, "The whole thing looks to me like a bat," bat is obviously the essential element of the reply, the remainder is superficial. In addition, the degree of common response was weighted by assigning an arbitrary value of 100 to the most frequent choice, both primary and secondary, and computing the remainder of them in terms of percentages of the most frequent. For example, if "bat" was given as the first response by 200 individuals and as a secondary response by 50 individuals, actually 250 individuals had given that particular reply to a given card. The last figure is, therefore, the absolute frequency and the one that would be used in assigning its weighted value. Assuming that "bat" has the highest frequency, then its weighted common value would be 100. Carrying the assumed example still further, suppose that, to the same card, 75 persons responded with the word "butterfly" as the first choice and 25 as second choice. The absolute frequency is, therefore, 100 and its weighted value is 100 divided by 250, the absolute frequency of "bat" (then multiplied by 100 to reduce to percent). In other words, the weighted common response score of "butterfly" is 40. The reader is referred to the Appendix for a complete tabulation of all responses given by more than one individual, together with the weighted value of each. Responses given by only one individual were considered as original.

Upon completing this phase of the study, each of the 500 tests was finally scored as follows:

(1) Reaction time for the first response to each card.
(2) The types of responses for each card including:
  (*a*) General, corresponding to Rorschach's G.
  (*b*) Detail, corresponding to Rorschach's D.
  (*c*) Small detail, corresponding to Rorschach's Dd.
  (*d*) Unshaded detail, corresponding to Rorschach's Dzw.
  (*e*) Form, corresponding to Rorschach's F.
  (*f*) Motion, corresponding to Rorschach's B.
  (*g*) Color, corresponding to Rorschach's Fb.
  (*h*) Animal, corresponding to Rorschach's T.
  (*i*) Animal anatomy, corresponding to Rorschach's Td.
  (*j*) Human, corresponding to Rorschach's M.
  (*k*) Human anatomy, corresponding to Rorschach's Md.
  (*l*) Abstraction—no corresponding Rorschach symbol; usually written out as "Abstraction."

(*m*) Other—no corresponding symbol; includes landscapes, objects, plants, etc.
(*n*) Common, or vulgar, corresponding to Rorschach's symbol V.
(*o*) Original, corresponding to Rorschach's symbol O.

(3) Totals for all ten cards according to the classification mentioned above, and in addition:

(*a*) The total number of cards analyzed by the detail to general method.
(*b*) The total number of cards analyzed by the general to detail method.
(*c*) The total number of cards producing general responses alone.
(*d*) The total number of cards producing detail responses alone.
(*e*) The total weighted vulgar score.
(*f*) The total number of secondary responses.

Carrying out the idea of making the test as objective as possible, interpretations of replies were frequently at variance with those commonly accepted. For example, Rorschach considers the reply "two clowns" as a kinesthetic answer, regardless of whether the subject says anything about movement or not (*3*). In the present study the clowns had to dance, bow, or go through some form of activity specifically mentioned by the subject to be designated as a motion or "B" response, otherwise the reply was simply scored as GF+M, "general", "form," plus "human." Naturally this convention cut down on the number of motion responses considerably, but justifiably. How is the examiner to know that the subject sees a dancing clown if he doesn't say so? Similarly, color had to be mentioned, either alone or in combination, to classify answers appropriately. If color, motion, and form were all included in the answer, no attempt was made to determine which was the dominant attribute. It was simply regarded as a compound form-color-motion response, thus reducing subjectivity to a minimum.

It was also found advantageous to record what part of the picture was seen at the time that the test was administered by marking an appropriate symbol for each response. Thus, if the whole picture served as a stimulus, a "G" was inserted, if a detail, "D," and so on. Usually if only a part of the ink blot is taken into consideration, the subject will say something like this, "This thing here looks like a crab-claw," which immediately lets the examiner know that a "detail" answer has been given. Occasionally it is necessary to ask the subject to locate the part of the card to which he is referring.

Originally it was intended to analyze only the test results, but it seemed that the computation of correlations between these results and certain other factors might prove more productive. As a consequence, information was obtained, from the clinical records of those who took the examination, covering age, marital status, offense, education, occupation, national descent, body build, continuity of the home, mental age,[3] educational grade status (Stanford Achievement

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[3] The tests used were Army Alpha and Beta.

Test), the number of incorrect responses given on the Woodworth Personal Data Sheet, and psychiatric diagnosis. More data might have been included, but the limitations of the Hollerith statistical punch card, to which the data were transcribed, prevented any further expansion. As previously explained, 24 cases had to be dropped because of lack of information on one or more of the above factors. All subsequent analyses are, therefore, based on 476 cases instead of 500.

THE RELATIONSHIP OF AGE TO REACTION TIME

The relationship of age to reaction time was approached from two angles: First, correlation coefficients were computed between age and time; second, critical ratios were determined between the average age of individuals with a reaction time of 20 seconds, or over, and the average age of those with a reaction time under 20 seconds. The results for each card are presented in table 1.

TABLE 1.—*Correlations between reaction time and age on the Rorschach Test, together with critical ratios between reaction times of 20 seconds, or over, and those under 20 seconds*

Card number	Coefficient of correlation	P. E. of coefficient	Group A [1]		Group B [2]		Critical ratio
			Number	Average age	Number	Average age	
I	.044	.030	32	35.468	444	33.277	.146
II	−.009	.031	110	33.318	366	33.456	.009
III	−.026	.031	108	35.768	368	33.030	.256
IV	−.080	.030	82	33.902	394	33.325	.038
V	.023	.031	46	34.348	430	33.326	.072
VI	−.081	.030	191	32.081	285	34.324	.158
VII	−.034	.030	242	32.913	234	33.953	.074
VIII	−.039	.030	30	32.833	446	33.464	.048
IX	−.051	.030	239	33.148	237	33.702	.038
X	.045	.030	74	34.189	402	33.283	.066

[1] Group A includes individuals with a reaction time of 20 seconds, or over.
[2] Group B includes individuals with a reaction time under 20 seconds.

A study of table 1 reveals immediately that there is no statistically significant relationship between age and reaction time. The coefficients of correlation are less than four times the probable error in all instances. Likewise, the critical ratios are all less than 1.96, the lower limit of significance when N is 476, according to Fisher's test (*4*). Furthermore, the limit is still higher as the frequency diminishes.

RELATIONSHIP OF AGE TO TYPE OF RESPONSE

The relationship of age to primary common and original responses was analyzed by the critical ratio method, but failed to reveal anything of statistical importance, as may be readily perceived by the data in table 2. Since it would be impracticable to tabulate all the critical ratios computed, only the highest ratios for each card are presented. Despite the lack of mathematical significance, it is interesting to note that the older men tend to give original responses and the younger men seem to show partiality toward the word "butterfly," wherever such a concept is applicable.

TABLE 2.—*Critical ratios for primary original and common responses, showing the greatest age differences on the Rorschach Test*

Card number	Responses showing greatest age differences						Critical ratio
	Highest average age			Lowest average age			
	Response	Number	Average age	Response	Number	Average age	
I	Original	42	36.071	Butterfly	136	32.757	.246
II	do	53	35.519	do	93	30.672	.334
III	do	90	34.222	do	11	27.954	.526
IV	Animal skin	86	36.046	Nothing	84	31.744	.316
V	Nothing	36	36.111	Butterfly	166	32.801	.252
VI	Original	65	35.077	Bear skin	22	28.090	.522
VII	do	79	36.551	Nothing	265	32.405	.300
VIII	do	61	34.385	Butterfly	10	32.500	.150
IX	do	91	35.137	do	11	26.591	.614
X	do	51	36.018	Rabbit's head	29	29.225	.744

The relationship of age to type of response was further investigated by computing critical ratios for various descriptive formulae typifying the primary responses to each card. For example, the word "bat," given in reply to the first card, is a general response, since it is dependent upon the shape of the whole figure. It is also an animal reply. Accordingly, the formula is GFA., meaning "general," "form," "animal" (form, because the shape of the figure provides the chief stimulus). Using this convention, the older men appear to have a fairly consistent, but statistically insignificant, tendency to choose the more unusual type of replies. One would expect such an observation, since the mature individuals tend to give original responses whose descriptive formulae are likely to differ from those of vulgar answers. The highest critical ratios obtained for each card are shown in table 3.

TABLE 3.—*Critical ratios for responses to Rorschach Test classified by representative formulae in comparison with age*

Card number	Formulae of responses showing greatest age differences						Critical ratio
	Highest average age			Lowest average age			
	Formula [1]	Number	Average age	Formula [1]	Number	Average age	
I	D. F. HA.	15	37.500	G. F. A.	358	32.947	.308
II	G. F. M. A.	17	38.676	D. F. A.	82	32.256	.486
III	G. F. H.	186	35.295	D. F. HA.	50	31.700	.241
IV	G. F. A.	55	34.591	N.	84	31.744	.211
V	N.	36	36.111	G. F. A.	377	33.189	.218
VI	D. F. HA.	10	36.500	N.	214	32.406	.236
VII	D. F. HA.	17	36.234	N.	265	32.405	.314
VIII	D. F. HA.	37	36.148	D. F. A.	355	32.993	.212
IX	D. F. HA.	57	35.921	D. F. AA.	41	32.774	.228
X	D. F. HA.	13	39.807	D. F. A.	297	32.415	.524

[1] Key to formulae: G.=general; D.=detail; F.=form; M.=motion; A.=animal; AA.=animal anatomy; H.=human; HA.=human anatomy; N.=nothing or no response.

Color, motion, unshaded detail, and small detail replies were so few in number that it was found impractical to make a study of these factors by individual card. This particular phase of the investigation will therefore be taken up later in connection with total scores.

RELATIONSHIP OF AGE TO ANALYTICAL METHOD

It seems that delinquents, as a whole, analyze the cards either by giving generalizations alone or details alone. However, those who proceed from general to detail observations, or vice versa, again tend to be the more mature individuals, but not to the point of mathematical significance. A coefficient of correlation of .115 ±.030 was obtained between the age and the number of cards interpreted by the general to detail method. An almost identical correlation coefficient, .119 ±.030, was determined between the age and the number of cards construed by the detail to general method. There is, apparently, no correlation between age and the number of cards analyzed by generalizations or details alone, the coefficients being .018 ±.031 and .013 ±.031, respectively.

RELATIONSHIP OF AGE TO TOTAL SCORES

The coefficients of correlation between age and the various total scores failed to reveal any statistically significant findings. However, just as in the case of the individual cards, there is a directional tendency for mature men to give original responses and for the younger men to give responses in common. The weighted common score brings this out to a little better advantage than the unweighted, as indicated by the slightly higher correlation coefficient. Of course, this difference is not sufficient to recommend the use of weighted common scores. The older men also tend to give a greater number of secondary responses, which, in turn, means that they are more likely to have higher total scores on all succeeding categories. This is particularly noticeable for the total human and for the total other responses, and least noticeable for total animal, abstract and unusual responses. The coefficients of correlation are presented in table 4.

TABLE 4.—*Relationship of age to total scores on Rorschach Test*

Total scores	Coefficient of correlation		Total scores	Coefficient of correlation	
	r	*P. E. of r*		*r*	*P. E. of r*
Common (or vulgar), unweighted	−.022	.031	Color	.104	.030
Common (or vulgar), weighted	−.130	.030	Animal	.000	.031
Original	.131	.030	Animal anatomy	.096	.030
Secondary	.156	.030	Human	.159	.030
General	.118	.030	Human anatomy	.098	.030
Detail	.012	.031	Abstract	.027	.031
Form	.125	.030	Other	.149	.030
Motion	.077	.030	Unusual [1]	.014	.031

[1] Small details, unshaded details, etc.

Critical ratios were also computed between the average age of individuals giving motion, color, abstract, and unusual responses and the average age of those who did not give such responses, on the chance that this procedure might bring out some variations of statistical significance. It failed to do so. The average age of the 68 individuals who gave motion responses is 35.000 years, and of those who did not, 33.162 years, yielding a critical ratio of .136. The average age of the 28 individuals who gave color responses is 36.428 and of those who did not, 33.236, yielding a critical ratio of .224. As for the unusual and abstract responses the differences in average age (between those who gave such responses and those who did not) are so slight as to be negligible, viz, .535 years in the first instance and .390 years in the other, with critical ratios of .034 and .028, respectively. Only 28 individuals gave unusual responses and 43 gave abstract answers.

SUMMARY

1. This is the first of a series of articles dealing with the relationship of various personal factors to the Rorschach Test as applied to 476 delinquents admitted to the U. S. Northeastern Penitentiary from July 1, 1935, to June 1, 1936.
2. The present study deals with the relationship of age to Rorschach Test results.
3. As far as delinquents are concerned, the age factor within the range of 17 to 77 years is of no statistical significance in Rorschach Test performance.
4. Certain sub-significant tendencies do exist, such as the inclination for older men to choose original responses and for the younger men to select vulgar replies. The older men also tend to give more secondary, form, human, and miscellaneous responses (inanimate objects, botanical terms, etc.) than the younger subjects.

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REFERENCES

(*1*) Hertz, Marguerite R.: The Rorschach Ink-Blot Test: Historical summary. Psychological Bulletin, 32: 33–66 (January 1935).

(*2*) Federal offenders, 1935–36. Bureau of Prisons, United States Department of Justice, Washington, D. C., pp. 218 and 61.

(*3*) Rorschach, Hermann: The application of the interpretation of form to psychoanalysis. J. Nervous and Mental Dis., 60: 229 (September 1924).

(*4*) Guilford, J. P.: Psychometric methods. McGraw-Hill Book Co., New York, 1936, pp. 548–49.

APPENDIX

COMMON RESPONSES AND WEIGHTED VALUES

NOTE.—Any response given by two or more individuals to a given card was considered as common (or vulgar). The degree of common response was determined by combining both primary and secondary choices of similar responses to get the absolute frequency. The word having the highest absolute frequency was given an arbitrary value of 100. The remainder of the values were computed as percentages of the absolute frequency of the response having the assigned value of 100. Thus, for card number 1, the most frequent choice was the word "bat." It was given as the first response by 189 individuals, and as a secondary choice by 52. The absolute frequency is, therefore, 241, and the weighted score value 100. The next most frequent was "butterfly," given as a primary reply by 145 subjects, and as a secondary by 48. The absolute frequency is, consequently, 193, which is 80 percent of 241, the absolute frequency for the word "bat." The weighted value is, therefore, 80. Decimal points were disregarded in calculating the percentages. Below are listed the common responses for each card, in alphabetical order, together with their weighted values.

CARD NO. I

Aeroplane	1
Animal	1
Bat	100
Bat, flying	1
Bear	2
Beetle	1
Bird	5
Blot	1
Blot, Ink	1
Body, lower part of	1
Body, part of human	2
Bone, pelvic	1
Bug	2
Bugs	1
Butterfly	80
Clouds	1
Crab	5
Dog	1
Eagle	4
Emblem	1
Flower	1
Fly	1
Hide	1
Insect	2
Island	1
Leaf	3
Legs, pair of	1
Lobster	1
Map	6
Map of U. S	1
Moth	3
Nothing	19
Skeleton, human	2
Skin, animal	1
Skin, bear	1
Tree	1
Turtle	1
Woman, shape of	2
X-ray	1

CARD NO. II

Animal	4
Animals, two	9
Bat	6
Bear	8
Bears, two	95
Bears, two dancing	3
Bears, two fighting	3
Bears, two, with snouts together	2
Bears, two, standing together	9
Bird	4
Body, human	3
Body, part of	5
Bones, set of, pelvic	2
Butterfly	95
Cat, face of	2
Cave	2
Clowns, two	7
Crab	2
Dog	3
Dogs, two	10
Dogs, two, nosing each other	2
Elephant	3
Elephants, two	3
Face	3
Faces, some	3
Fly	2
Head, dog's	3
Heads, bear	3
Heads, dogs'	3
Heads of two dogs	3
Hide of an animal	3
Hole in the ground	3
Lamp	3
Map	2
Men, two	3
Moth	3
Nothing	100
Penis, head of*	3
Rabbit	3
Rabbits, two	2
Rectum*	5
Skin of bear	4
Vagina, woman's*	2

CARD NO. III

Animal	3
Bat	1
Bird	4
Birds, two	9
Body, part of	3
Body, lower part of	1
Bones	2
Boys, two colored	2
Bow tie	2
Butterfly	14
Cartoon	2
Chest, X-ray of	1
Clowns, two	6
Crab	5
Dogs	1
Face	1
Feet, animal's	1
Feet, woman's	1
Fish	1
Frog	2
Gaston and Alphonse	1
Guys, two	1
Human beings	1
Icicles	1
Insect	1
Kidneys	1
Ladies, two	1
Lion and tail	1
Lungs, pair of	4
Lungs, picture of	2
Man	5
Men, two	100
Men, two (like a cartoon)	3
Men, two funny	2
Men, two (pulling a crab apart)	1
Men, two (sketch of)	2
Men, two (at a table)	1
Monkey	2
Monkeys, two	13
Nothing	79
Pelvis	3
People, two	10
Persons	1
Person, inside of	1
Skeleton, human	18
Shines, two	1
Something	1
Spider	1
Spine	3
Stomach	1
Stomach, lower part of	1
Turkey	1
Turkeys	1

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* Includes unprintable synonyms.

CARD NO. IV

Animal	2	Fur of animal	1	Rug, bear	1
Back of man	1	Head of buffalo	2	Shadow	1
Bat	6	Head, snail's	1	Skin	13
Bird	1	Hide	100	Skin, animal	33
Bone, back	1	Hide of animal	25	Skin of animal being dried	1
Bug	4	Hide of bear	3	Skin of animal hung up to dry	1
Butterfly	9	Hide from fur-bearing animal	1	Skin, bear	13
Caterpillar	2	I don't know anything	1	Skin of fox	1
Fish	7	Insect	4	Skin of lions	2
Fish, devil	2	Monkey	1	Skin, tiger	2
Fish, jelly	1	Nothing	63	Spine	4
Fly	2	Pelt	1	Tree	2
Frog	2	Pelt of animal	6	Tree, stump of	2
Fur	1	Rug	3	X-ray	1

CARD NO. V

Animal	2	Eagle	5	Moth	15
Bat	83	Eagle in flight	1	Nothing	17
Bat, big	1	Face	1	Rabbit	1
Bat, flying	3	Faces	1	Skin	3
Bird	12	Fly	2	Skin of animal	3
Bird, flying	3	Hide	8	South America	1
Bug	1	Insect	3	Spider	1
Bug, flying	1	Leaf	1	Wings, pair of	1
Butterfly	100	Leg, cow's	1		

CARD NO. VI

Animal	2	Fish, craw	1	Nothing	100
Back, some one's	1	Fish, deep sea	1	Pelt, animal	1
Bat	4	Frog	1	Rug	2
Bear	1	Head of animal	1	Skin	5
Bug	1	Head, snake's	2	Skin, animal	18
Butterfly	7	Hide	32	Skin, bear	12
Caterpillar	1	Hide of animal	7	Skin, hung for drying	1
Crab	5	Hide, bear	1	Spider	1
Dog	1	Hide, drying	1	Spine	1
Face	1	I don't know what it is	2	Turtle	1
Fish	2	Insects	1	Worm	1

CARD NO. VII

Bird	1	Head, wolf's	1	Pelvis	1
Bridge	1	Heads, dogs'	1	People	1
Bug	1	Heads of two women	1	Rabbits, two facing each other	1
Butterfly	7	Hide	1	Skin, torn	1
Cloud	2	Hide of animal	1	Smoke	1
Clouds	27	Ice, sheets of	1	Snow	1
Comic sheet	1	Islands	2	Stomach	1
Dogs, two	1	Land surrounded by water	1	Tail	1
Face, animal's	1	Leg, hind of rabbit	1	Tails of animals	1
Face, ape's	1	Legs, rabbit	1	Vagina	1
Face, dog's	1	Lungs	1	Women, two	3
Faces	5	Map	3	Women, two, old	2
Faces, false	1	Monkey	1	X-ray	1
Faces, two	1	Mountain	1		
Head of animal	1	Nothing	100		

CARD NO. VIII

Anatomy, part of human	1	Butterflies, two	1	Nothing	7
Animal	5	Chest, human	1	Opossums	1
Animal on the side	1	Chest, X-ray of	1	Peak, top of	1
Animals	3	Coyote	1	Person, inside of	1
Animals jumping	1	Dog	1	Rat	1
Animals, two	100	Dogs, two	1	Rats, two	6
Animals, two colored	1	Faces	2	Ribs	7
Back bone	5	Flower	2	Rocks	1
Bear	2	Foxes, two	2	Rodents	1
Bears	2	Head, animal	1	Sheep	1
Bears, two	14	Heads, frog	1	Shoulders, two	1
Bears, two polar	1	Heart	1	Skeleton	5
Beavers, two	1	Insects	1	Skeleton, part of	1
Birds, two	1	Kidneys	1	Spine	17
Body, diagram of	1	Lions	1	Squirrel	1
Body, inside of human	2	Lions, two	1	Squirrels, two	1
Body, human	1	Lizards, two	1	Stomach, inside of	1
Body, part of	2	Lungs	1	Tiger	1
Body, X-ray of	1	Man, skeleton of	1	Tree	8
Bones	1	Men, two	1	Wolves, two	2
Buffalo	1	Mice, two	1	X-ray	2
Bulls, two	1	Mountain	6		
Butterfly	11	Muskrats, two	1		

CARD NO. IX

Anatomy, human	1
Animal	3
Animal, water	1
Animals, two	1
Antlers, deer	10
Back bone	2
Body, human	1
Body, part of human	1
Body, lower part of	1
Body, X-ray of	1
Butterfly	6
Cloud	1
Clouds	3
Colors, two	2
Deer	1
Dog	1
Face, person's	1
Face, someone's	1
Faces, animal	1
Flowers	2
Head, alligator	2
Head, deer	8
Head, man's	1
Head, moose	1
Head, sheep's	1
Heads, animal	1
Heads, two	8
I don't know	1
Kidneys	2
Lungs	1
Man	1
Map	1
Map of Alaska	1
Men, standing together	1
Mountain	1
Nothing	100
Person, inside of	8
Rectum	2
Rectums, two	1
Reindeer	1
Rocks	1
Sheep	1
Skeleton	1
Spine	8
Stomach	1
Tree	1
Trees	1
Water	2
X-ray	2

CARD NO. X

Animal	4
Animal, deep sea	1
Animal, jumping	1
Animals	8
Animals, sea	2
Animals, two	3
Beetle	2
Beetles	1
Birds	5
Birds, two	3
Body, human	1
Body, part of	2
Back bone	1
Bone, neck	1
Bugs	9
Butterfly	4
Caterpillar	6
Caterpillars	5
Cave	1
Cherries, two	1
Crab	9
Crabs	100
Crabs, two	7
Deer	7
Dog	2
Dogs, two	1
Face	2
Face, rabbit's	2
Faces	2
Fish	4
Fish, craw	3
Fish, sea	2
Flowers	10
Goat	1
Goat with whiskers	2
Grasshopper	3
Grasshoppers	3
Head, animal	1
Head, deer	1
Head, goat	8
Head, rabbit's	35
Horse, sea	2
Insect	9
Insects	25
Insects, two	3
Lions, two	1
Lobster	4
Lobsters	5
Lungs	1
Men, two	2
Moose	1
Nothing	49
Octopus	2
Pelvis	1
Pole	1
Rabbit	9
Roots, tree	2
Sheep	8
Skeleton	2
Snakes	1
Spider	14
Spiders	81
Spine	6
Spine, part of	1
Squirrels, two	1
Tree	2
Trees	1
Tree trunks	1
Weed, sea	8
Wish-bone	2
Wish-bone of a chicken	1
Worm	2
Worm, tomato	1
Worms	4
X-ray	2

MENTAL DEFECTIVES AND EPILEPTICS IN INSTITUTIONS IN THE UNITED STATES, 1936

The accompanying summary of the results of the 1936 census of mental defectives and epileptics in institutions in the United States primarily for these classes of patients is taken from data issued by the Bureau of the Census. The figures are preliminary and are subject to possible correction later.

Movement of patient population.—Table 1 shows, for 1936, the movement of the patient population, by sex, in institutions for mental defectives and epileptics, that is, the number of patients at the beginning of the year, the number of admissions and of separations during the year, and the number present at the end of the year. Separate figures are given for State, city, and private institutions.

The figures presented in this table show that, in 1936, State institutions cared for a very large proportion of the total number of these patients in institutions conducted especially for these classes. The fact that the proportion of the total number of patients on the books of State institutions at the beginning and at the end of the year, respectively, was so much larger than the proportion admitted to or leaving these institutions during the year indicates that, as a rule, the patients remain in State institutions much longer than in either city or private institutions. It is also probable that incurables form a much larger proportion of the patients admitted to State institutions than of those admitted to city and private hospitals for the care of these patients.

Significance of the data.—These statistics are of value chiefly in showing what provision has been made for the treatment of mental defectives and epileptics in special institutions, the types of these patients being cared for, and the relative importance of the different types. It should be clearly recognized, however, that the statistics relating to patients in institutions primarily for mental defectives and epileptics do not furnish even an approximate measure of the total number of such patients either in the country as a whole or in the several States. The institutions established for the care of mental defectives and epileptics contain only a small part of the total number of such persons; the vast majority of them live at large in the community. Also, many are inmates of prisons and reformatories, others are in almshouses, and some are in hospitals for mental patients.

TABLE 1.—*Movement of patient population in institutions for mental defectives and epileptics, by class of institution, 1936*

Class of patients	Number				Percent of total		
	Total	State institutions	City institutions	Private institutions	State institutions	City institutions	Private institutions
Patients on books at beginning of year	111,559	106,197	818	4,544	95.2	0.7	4.1
Male	58,465	55,692	431	2,342	95.3	.7	4.0
Female	53,094	50,505	387	2,202	95.1	.7	4.1
In institution	96,997	91,756	818	4,423	94.6	.8	4.6
On parole or otherwise absent	14,562	14,441	--------	121	99.2	--------	.8
Admissions during year	12,525	11,565	56	904	92.3	.4	7.2
Male	6,952	6,453	32	467	92.8	.5	6.7
Female	5,573	5,112	24	437	91.7	.4	7.8
First admissions	10,765	9,938	34	793	92.3	.3	7.4
Readmissions	831	756	22	53	91.0	2.6	6.4
Transfers from other institutions for mental defectives and epileptics	929	871	--------	58	93.8	--------	6.2
Separations during year	9,510	8,481	251	778	89.2	2.6	8.2
Male	5,711	5,191	126	394	90.9	2.2	6.9
Female	3,799	3,290	125	384	86.6	3.3	10.1
Discharges	5,353	4,785	70	498	89.4	1.3	9.3
Transfers to other institutions for mental defectives and epileptics	1,296	972	171	153	75.0	13.2	11.8
Deaths in institution	2,808	2,671	10	127	95.1	.4	4.5
Deaths while on parole	58	53	--------	--------	100.0	--------	--------
Patients on books at end of year	114,574	109,281	623	4,670	95.4	.5	4.1
Male	59,706	56,954	337	2,415	95.4	.6	4.0
Female	54,868	52,327	286	2,255	95.4	.5	4.1
In institution	99,374	94,212	623	4,539	94.8	.6	4.6
On parole or otherwise absent	15,200	15,069	--------	131	99.1	--------	.9

In collecting the statistics for 1936, separate schedules were used for reporting mental defectives and epileptics. In previous years they were reported on the same schedules, and some patients were reported as both mentally defective and epileptic. This combination is not used for 1936, an entire separation of the two classes being made according to criteria for determining the primary cause of admission to the institution, submitted by committees of the American Psychiatric Association and the American Association on Mental Deficiency.

Table 2 shows the movement of patient population in State institutions, for both classes for 1936 and 1935, and for each class separately, by sex, for 1936. Most of the institutions show a few cases reported as neither mentally defective nor epileptic. There was a slight decrease in the number of admissions to the institutions during 1936 as compared with 1935; but as there was also a decrease in the number of discharges, the number of patients on the books at the end of the year exceeded the number in 1935.

The table shows that the number of mental defectives greatly exceeded the number of epileptics in institutions, and in practically all of the items for both classes the number of males exceeded the number of females. Of the patients on books at the end of the year, a higher percentage of the mental defectives were on parole (14.4) than of the epileptics (10.1). Of the separations during the year, deaths in the institution showed a higher percentage of the epileptics (47.3) than of the mental defectives (27.3).

TABLE 2.—*Movement of patient population in State institutions for mental defectives and epileptics, by sex: 1936 and 1935*

Class of patients	Total		Mental defectives, 1936			Epileptics, 1936			Neither mentally defective nor epileptic, 1936
	1936	1935	Total	Male	Female	Total	Male	Female	
Patients on books at beginning of year	106,197	103,227	86,783	45,344	41,439	17,813	9,666	8,147	1,601
In institution	91,756	89,760	74,508	37,878	36,630	15,944	8,422	7,522	1,304
On parole or otherwise absent	14,441	13,467	12,275	7,466	4,809	1,869	1,244	625	297
Admissions during year	11,565	12,067	9,009	4,986	4,023	2,350	1,369	981	206
First admissions	9,938	10,299	7,656	4,072	3,584	2,099	1,218	881	183
Readmissions	756	765	513	304	209	236	146	90	7
Transfers from other institutions for mental defectives and epileptics	871	1,003	840	610	230	15	5	10	16
Separations during year	8,481	8,564	6,243	3,872	2,371	1,968	1,202	766	270
Discharges	4,785	4,911	3,576	2,169	1,407	998	626	372	211
Transfers to other institutions for mental defectives and epileptics	972	1,018	921	662	259	30	17	13	21
Deaths in institution	2,671	2,547	1,704	1,013	691	931	552	379	36
Deaths while on parole	53	88	42	28	14	9	7	2	2
Patients on books at end of year	109,281	106,730	89,549	46,458	43,091	18,195	9,833	8,362	1,537
In institution	94,212	92,329	76,651	38,746	37,905	16,352	8,583	7,769	1,209
On parole or otherwise absent	15,069	14,401	12,898	7,712	5,186	1,843	1,250	593	328

FIRST ADMISSIONS

The term "first admissions" is here used to designate persons admitted to institutions for mental defectives and epileptics for the first time. Of the 10,765 first admissions to such institutions during 1936, 9,938, or 92.3 percent, were admissions to State institutions. Tables 3, 4, and 5 relate to first admissions to State institutions.

Table 3 shows, by sex, the number of first admissions to State institutions during 1936, distributed by States and classified as to whether mentally defective or epileptic.

The number of first admissions classified as mentally defective exceeded the number of epileptics in each of the 29 States showing both classes. Sixteen States and the District of Columbia reported no epileptics admitted to State institutions during 1936. Arizona, Arkansas, and Nevada have no institutions primarily for mental defectives and epileptics.

TABLE 3.—*First admissions to State institutions, by class and sex, by States, 1936*

State	Mental defectives			Epileptics		
	Total number	Male	Female	Total number	Male	Female
United States	7,656	4,072	3,584	2,099	1,218	881
New England:						
Maine	17	9	8	----------	----------	----------
New Hampshire	42	29	13	----------	----------	----------
Vermont	22	8	14	----------	----------	----------
Massachusetts	452	242	210	99	57	42
Rhode Island	40	14	26	3	1	2
Connecticut	45	22	23	13	5	8
Middle Atlantic						
New York	1,819	979	840	385	218	167
New Jersey	290	122	168	173	100	73
Pennsylvania	298	135	163	80	70	10
East North Central:						
Ohio	315	165	150	225	118	107
Indiana	187	93	94	114	71	43
Illinois	567	304	263	166	94	72
Michigan	509	319	190	125	80	45
Wisconsin	227	124	103	30	18	12
West North Central.						
Minnesota	200	96	104	61	21	40
Iowa	171	104	67	51	34	17
Missouri	102	56	46	40	17	23
North Dakota	71	44	27	----------	----------	----------
South Dakota	51	34	17	9	5	4
Nebraska	163	90	73	27	18	9
Kansas	124	70	54	112	62	50
South Atlantic:						
Delaware	23	14	9	----------	----------	----------
Maryland	126	68	58	----------	----------	----------
District of Columbia	39	21	18	----------	----------	----------
Virginia	173	73	100	56	33	23
West Virginia	32	13	19	13	9	4
North Carolina	51	33	18	----------	----------	----------
South Carolina	34	18	16	----------	----------	----------
Georgia	36	17	19	----------	----------	----------
Florida	17	9	8	4	3	1
East South Central:						
Kentucky	67	39	28	----------	----------	----------
Tennessee	34	22	12	1	----------	1
Alabama	33	27	6	----------	----------	----------
Mississippi	25	15	10	----------	----------	----------
West South Central.						
Louisiana	124	82	42	38	21	17
Oklahoma	158	94	64	----------	----------	----------
Texas	142	40	102	170	96	74

TABLE 3.—*First admissions to State institutions, by class and sex, by States, 1936*—Continued

State	Mental defectives			Epileptics		
	Total number	Male	Female	Total number	Male	Female
Mountain:						
Montana	36	17	19			
Idaho	37	19	18	9	6	3
Wyoming	46	25	21	16	10	6
Colorado	51	28	23	6	3	3
New Mexico	8	4	4			
Utah	75	44	31	5	5	
Pacific:						
Washington	82	41	41	24	16	8
Oregon	108	57	51			
California	387	193	194	44	27	17

Mental status.—According to the classification of mental defectives by mental status here used, an "idiot" is a mentally defective person having a mental age of not more than 35 months, or, if a child, an intelligence quotient of less than 25; an "imbecile" has a mental age of between 36 and 83 months, inclusive, or an intelligence quotient between 25 and 49; and a "moron" has a mental age of between 84 and 143 months, inclusive, or an intelligence quotient between 50 and 74.

As the mental defectives admitted to institutions consist largely of those who are unable to make adequate social adjustments, the proportions of idiots and of imbeciles among the first admissions of mental defectives are probably much higher than among the total mental defectives.

TABLE 4.—*First admissions of mental defectives to State institutions, by sex and mental status, 1936*

Mental status	Number			Percent distribution		
	Total	Male	Female	Total	Male	Female
Total	7,656	4,072	3,584	100.0	100.0	100.0
Moron	3,606	1,844	1,762	47.1	45.3	49.2
Imbecile	2,389	1,273	1,116	31.2	31.3	31.1
Idiot	1,126	631	495	14.7	15.5	13.8
Unclassified	535	324	211	7.0	8.0	5.9

Type of epilepsy.—The classification of epilepsy as symptomatic and idiopathic is that of the American Psychiatric Association, "symptomatic" signifying cases in which the attacks result from a definite underlying disease, and "idiopathic" signifying attacks resulting from unknown causes. It may be noted that epileptics of the idiopathic type far outnumbered those of the symptomatic type among first admissions to State institutions.

TABLE 5.—*First admissions of epileptics to State institutions, by sex and type of epilepsy, 1936*

Type of epilepsy	Number			Percent distribution		
	Total	Male	Female	Total	Male	Female
Total	2,099	1,218	881	100.0	100.0	100.0
Symptomatic	579	350	229	27.6	28.7	26.0
Idiopathic	1,281	726	555	61.0	59.6	63.0
Unclassified	239	142	97	11.4	11.7	11.0

DEATHS DURING WEEK ENDED MAY 7, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended May 7, 1938	Corresponding week, 1937
Data from 87 large cities of the United States: [1]		
Total deaths	8,125	[2] 8,489
Average for 3 prior years	9,017	
Total deaths, first 18 weeks of year	158,609	178,339
Deaths under 1 year of age	529	[2] 531
Average for 3 prior years	536	
Deaths under 1 year of age, first 18 weeks of year	9,756	10,988
Data from industrial insurance companies:		
Policies in force	68,836,988	69,591,303
Number of death claims	12,167	13,214
Death claims per 1,000 policies in force, annual rate	9.2	9.9
Death claims per 1,000 policies, first 18 weeks of year, annual rate	10.0	11.3

[1] Figures for the weeks ended Apr. 23 and 30, 1938, include data for 87 cities, except as to the items "total deaths" and "deaths under 1 year of age" for the corresponding weeks of 1937, which are for 86 cities.

[2] Data for 86 cities.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (------) indicate that cases or deaths may have occurred although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 14, 1938, and May 15, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937
New England States:								
Maine	4	1	------	1	133	8	0	0
New Hampshire	0	0	------	------	61	28	0	0
Vermont	0	3	------	------	183	------	0	0
Massachusetts	2	1	------	------	381	763	1	6
Rhode Island	0	0	------	------	1	74	0	0
Connecticut	5	7	1	1	80	833	1	0
Middle Atlantic States:								
New York	38	41	[1] 4	[1] 7	3,754	1,664	4	6
New Jersey	18	14	7	4	934	1,814	2	0
Pennsylvania	28	16	------	------	2,925	1,530	4	8
East North Central States:								
Ohio	5	24	------	57	1,801	2,096	2	5
Indiana	9	13	1	11	670	609	0	5
Illinois [3]	36	36	8	21	1,590	296	3	8
Michigan [3]	15	8	------	------	3,890	195	1	4
Wisconsin	4	10	32	14	2,833	44	0	0
West North Central States:								
Minnesota	2	4	1	1	239	15	1	3
Iowa	2	4	3	2	348	8	0	0
Missouri	9	21	15	32	437	39	1	3
North Dakota	1	1	15	1	170	2	0	1
South Dakota	2	1	------	------	------	------	2	0
Nebraska	4	4	------	1	215	14	0	4
Kansas	8	2	2	1	402	41	2	0
South Atlantic States:								
Delaware	2	0	------	------	27	28	0	0
Maryland [2, 3, 4]	6	7	5	8	116	446	2	2
District of Columbia	2	8	------	------	15	104	0	2
Virginia [3]	13	8	------	------	353	496	3	6
West Virginia	3	1	33	20	455	39	1	9
North Carolina [3]	12	18	2	7	1,724	237	2	5
South Carolina	6	6	94	115	169	74	0	2
Georgia [4]	5	8	------	------	282	------	0	4
Florida [4]	8	7	4	------	137	------	0	1

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 14, 1938, and May 15, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937
East South Central States:								
Kentucky	7	2	9	5	286	382	6	11
Tennessee	7	9	19	97	134	98	3	5
Alabama [4]	7	8	35	47	352	11	8	5
Mississippi [3]	7	2					0	0
West South Central States:								
Arkansas	10	5	27	50	240	11	1	1
Louisiana	9	12	5	17	13	11	3	1
Oklahoma [5]	0	2	25	14	178	60	0	1
Texas [4]	27	32	159	230	110	758	3	8
Mountain States:								
Montana [2]	1	0			42	10	0	0
Idaho [2]	0	0	9	35	65	22	0	1
Wyoming [2] [6]	0	1			19	28	0	1
Colorado [6]	22	6			299	25	3	1
New Mexico	2	1	1	2	14	72	0	0
Arizona	1	6	32	52	19	66	0	0
Utah [2] [3]	2	0			293	40	0	1
Pacific States:								
Washington	0	1			48	62	0	2
Oregon [2]	6	4	18	30	25	15	0	0
California [4]	24	31	42	76	640	212	8	3
Total	381	386	608	959	27,121	12,870	62	115
First 19 weeks of year	10,035	9,258	40,333	208,978	613,131	153,122	1,542	3,110

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938
New England States:									
Maine	0	0	11	17	0	0	0	0	28
New Hampshire	0	0	21	5	0	0	0	0	1
Vermont	0	0	9	7	0	0	0	0	35
Massachusetts	0	0	423	233	0	0	0	2	134
Rhode Island	0	0	12	48	0	0	0	0	32
Connecticut	0	0	111	169	0	0	1	1	155
Middle Atlantic States:									
New York	0	0	727	910	0	0	8	6	519
New Jersey	0	0	95	241	0	0	3	0	189
Pennsylvania	0	1	293	479	0	0	10	8	162
East North Central States:									
Ohio	1	0	280	501	4	0	14	5	240
Indiana	2	1	80	120	26	21	5	1	6
Illinois [2]	0	1	393	628	89	43	17	1	132
Michigan [3]	1	2	398	721	0	9	1	6	296
Wisconsin	0	0	131	285	5	1	0	1	187
West North Central States:									
Minnesota	0	0	149	163	8	21	2	6	12
Iowa	1	0	91	161	20	31	2	0	28
Missouri	0	1	125	24	16	0	2	3	34
North Dakota	0	0	36	23	5	5	0	0	29
South Dakota	0	0	23	40	5	1	0	0	27
Nebraska	0	0	47	76	5	7	0	0	13
Kansas	0	0	83	201	11	9	0	1	149
South Atlantic States:									
Delaware	0	0	7	2	0	0	0	0	15
Maryland [2] [3] [4]	0	0	74	33	0	0	7	2	70
District of Columbia	0	0	18	10	0	0	1	0	11
Virginia [2]	0	0	21	18	0	0	6	7	80
West Virginia	0	0	30	48	0	0	5	3	84
North Carolina [3]	2	0	22	22	2	0	8	4	388

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 14, 1938, and May 15, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938	Week ended May 15, 1937	Week ended May 14, 1938
South Atlantic States—Con.									
South Carolina	0	0	3	--------	0	0	3	1	90
Georgia [4]	0	1	7	9	1	0	5	13	106
Florida [4]	1	0	3	7	0	0	8	2	32
East South Central States:									
Kentucky	1	0	46	36	14	0	0	7	49
Tennessee	0	0	20	17	2	0	3	3	25
Alabama [4]	1	1	6	8	1	0	6	4	57
Mississippi [3]	1	5	5	6	0	0	1	8	--------
West South Central States:									
Arkansas	1	0	6	16	2	1	3	1	34
Louisiana	0	0	13	18	0	0	9	14	44
Oklahoma [5]	0	1	18	21	12	1	1	3	36
Texas [4]	1	1	63	93	17	6	12	7	270
Mountain States:									
Montana [2]	1	0	10	17	8	18	1	0	82
Idaho [2]	0	0	3	19	14	1	1	0	10
Wyoming [2,6]	0	0	4	7	0	5	4	0	7
Colorado [6]	0	0	47	24	3	15	2	3	40
New Mexico	1	0	29	21	0	0	0	4	19
Arizona	0	0	5	16	12	0	1	2	24
Utah [2,3]	0	0	21	10	0	0	1	0	60
Pacific States:									
Washington	0	1	25	22	22	6	2	1	145
Oregon [2]	1	0	37	45	19	25	1	1	20
California [4]	0	3	197	177	25	24	14	8	366
Total	16	19	4,284	5,783	298	250	170	129	4,572
First 19 weeks of year	375	395	109,484	129,276	9,805	5,987	2,374	2,119	81,119

[1] New York City only.

[2] Rocky Mountain spotted fever, week ended May 14, 1938, 19 cases as follows: Illinois, 1; Maryland, 3; Virginia, 2; North Carolina, 1; Montana, 2; Idaho, 1; Wyoming, 5; Utah, 1; Oregon, 3.

[3] Period ended earlier than Saturday.

[4] Typhus fever, week ended May 14, 1938, 25 cases as follows: Maryland, 2; Georgia, 8; Florida, 1; Alabama, 7; Texas, 6; California, 1.

[5] For the week ended May 15, 1937, and subsequently, figures for Oklahoma City and Tulsa are included.

[6] Colorado tick fever, week ended May 14, 1938, 5 cases as follows: Wyoming, 1; Colorado, 4.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
March 1938										
Alaska	0	0	131	--------	--------	--------	0	8	0	2
New Hampshire	0	0	6	--------	--------	--------	0	60	0	0
April 1938										
Idaho	2	3	35	--------	77	--------	0	44	70	3
Iowa	4	8	11	--------	925	--------	1	880	195	5
Michigan	10	33	7	1	17,574	--------	0	1,934	33	14
New Hampshire	0	0	--------	--------	--------	--------	0	42	0	2
New Jersey	3	57	39	1	5,766	--------	2	553	0	13
Tennessee	16	22	215	46	1,823	9	2	133	10	9
Wyoming	0	2	--------	--------	192	--------	0	30	9	0

Summary of monthly reports from States—Continued

March 1938

	Cases
Alaska:	
Chickenpox	24
Impetigo contagiosa	7
Mumps	63
Septic sore throat	7
Undulant fever	1
Whooping cough	11

April 1938

	Cases
Chickenpox:	
Idaho	65
Iowa	337
Michigan	1,948
New Jersey	2,667
Tennessee	156
Wyoming	101
Conjunctivitis:	
Idaho	6
Dysentary:	
Iowa (bacillary)	9
Michigan (amoebic)	2
Tennessee (bacillary)	9
Encephalitis, epidemic or lethargic:	
Michigan	2
New Jersey	1
Tennessee	1
German measles:	
Iowa	11
Michigan	350
New Jersey	113
Tennessee	2

April 1938—Continued

	Cases
Hookworm disease:	
Tennessee	1
Jaundice, epidemic:	
Michigan	5
Lead poisoning:	
New Jersey	1
Mumps:	
Idaho	245
Iowa	107
Michigan	1,320
New Jersey	1,445
Tennessee	469
Wyoming	41
Ophthalmia neonatorum:	
New Jersey	18
Tennessee	1
Paratyphoid fever:	
Michigan	1
New Jersey	2
Tennessee	2
Puerperal septicemia:	
Tennessee	2
Rabies in animals:	
Michigan	1
New Jersey	26
Rabies in man:	
Tennessee	1
Rocky Mountain spotted fever:	
Idaho	2
Wyoming	6

April 1938—Continued

	Cases
Septic sore throat:	
Idaho	7
Iowa	15
Michigan	20
New Jersey	26
Tennessee	20
Wyoming	4
Tetanus:	
Tennessee	2
Trachoma:	
Michigan	1
Tennessee	4
Trichinosis:	
New Jersey	2
Tularaemia:	
Tennessee	2
Undulant fever:	
Iowa	5
Michigan	13
New Jersey	6
Tennessee	3
Vincent's infection:	
Idaho	5
Michigan	11
Tennessee	1
Whooping cough:	
Idaho	58
Iowa	100
Michigan	1,272
New Jersey	748
Tennessee	190
Wyoming	64

PLAGUE INFECTION IN GROUND SQUIRREL IN BAKER COUNTY, OREG.

Under date of May 10, 1938, Senior Surg. C. R. Eskey, in charge of plague-suppressive measures, San Francisco, Calif., reported that plague infection had been demonstrated in tissue from one *Citellus oregonus* found dead April 23, 1938, 7 miles northwest of Hereford, Baker County, Oreg.

CASES OF VENEREAL DISEASES REPORTED FOR MARCH 1938

These reports are published monthly for the information of health officers in order to furnish current data as to the prevalence of the venereal diseases. The figures are taken from reports received from State and city health officers. They are preliminary and are therefore subject to correction. It is hoped that the publication of these reports will stimulate more complete reporting of these diseases.

Reports from States

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Alabama	1,946	6.72	307	1.06
Arizona [1]				
Arkansas [2]	1,438	7.02	356	1.74
California	2,432	3.95	1,533	2.49
Colorado	237	2.21	103	.96
Connecticut	256	1.47	141	.81
Delaware	278	10.65	44	1.69
District of Columbia	232	3.70	113	1.80
Florida [2]	2,142	12.83	305	1.83
Georgia	2,314	7.50	367	1.19
Idaho	58	1.18	31	.63
Illinois	2,150	2.73	1,151	1.46
Indiana	373	1.07	54	.16
Iowa [2]	404	1.58	191	.75
Kansas	260	1.39	79	.42

See footnotes at end of table.

Reports from States—Continued

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Kentucky	963	3.30	422	1.45
Louisiana	682	3.20	63	.30
Maine [2]	43	.50	49	.57
Maryland	1,252	7.46	333	1.98
Massachusetts	635	1.43	463	1.05
Michigan	1,656	3.43	641	1.33
Minnesota	339	1.28	223	.84
Mississippi	2,780	13.74	2,405	11.89
Missouri	478	1.20	91	.23
Montana [2]	66	1.22	36	.67
Nebraska	59	.43	67	.49
Nevada	62	6.14	32	3.17
New Hampshire	21	.41	14	.27
New Jersey	1,045	2.41	329	.76
New Mexico	147	3.48	34	.81
New York	4,550	3.51	1,792	1.38
North Carolina	3,916	11.21	678	1.94
North Dakota	28	.40	40	.57
Ohio [2]	2,099	3.12	402	.60
Oklahoma [2]	314	1.23	231	.91
Oregon	96	.93	149	1.45
Pennsylvania	1,903	1.87	261	.26
Rhode Island	114	1.67	51	.75
South Carolina [2]	383	2.04	302	1.61
South Dakota	34	.49	21	.30
Tennessee	1,274	4.40	289	1.00
Texas	986	1.60	318	.52
Utah	9	.17	18	.35
Vermont	18	.47	23	.60
Virginia	1,519	5.61	363	1.34
Washington	384	2.32	304	1.83
West Virginia	447	2.40	112	.60
Wisconsin [2]	46	.16	101	.35
Wyoming [2]	3	.13	3	.13
Total	42,871	3.33	15,435	1.20

Reports from cities of 200,000 population or over

Akron, Ohio [1]	----------	----------	----------	----------
Atlanta, Ga.[1]	----------	----------	----------	----------
Baltimore, Md	757	9.17	225	2.73
Birmingham, Ala	336	13.67	79	2.80
Boston, Mass	243	3.07	174	2.20
Buffalo, N. Y	144	2.43	71	1.20
Chicago, Ill	1,052	2.95	753	2.11
Cincinnati, Ohio [1]	----------	----------	----------	----------
Cleveland, Ohio [1]	----------	----------	----------	----------
Columbus, Ohio	103	3.37	22	.72
Dallas, Tex	470	16.23	79	2.73
Dayton, Ohio [1]	----------	----------	----------	----------
Denver, Colo	194	6.54	134	4.52
Detroit, Mich	867	5.01	333	1.92
Houston, Tex.[4]	313	9.35	48	1.43
Indianapolis, Ind	38	1.01	36	.95
Jersey City, N. J.[1]	----------	----------	----------	----------
Kansas City, Mo	81	1.92	4	.09
Los Angeles, Calif	670	4.68	377	2.63
Louisville, Ky	463	14.29	136	4.20
Memphis, Tenn	572	21.42	59	2.21
Milwaukee, Wis.[5]	----------	----------	----------	----------
Minneapolis, Minn	81	1.66	59	1.21
Newark, N. J	398	8.59	141	3.04
New Orleans, La	49	1.02	40	.83
New York, N. Y	2,974	4.07	1,240	1.70
Oakland, Calif	69	2.28	47	1.55
Omaha, Nebr	35	1.59	14	.64
Philadelphia, Pa.[1]	----------	----------	----------	----------
Pittsburgh, Pa.[1]	----------	----------	----------	----------
Portland, Oreg	62	1.98	82	2.61
Providence, R. I	58	2.24	30	1.16

See footnotes at end of table.

Reports from cities of 200,000 population or over—Continued

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly cases rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Rochester, N. Y	64	1.90	43	1.28
St. Louis, Mo	345	4.13	108	2.01
St. Paul, Minn	44	1.56	30	1.06
San Antonio, Tex	143	5.60	69	2.74
San Francisco, Calif	208	3.10	210	3.13
Seattle, Wash	182	4.79	132	3.48
Syracuse, N. Y	91	4.18	27	1.24
Toledo, Ohio [1]				
Washington, D. C.[6]	232	3.70	113	1.80

[1] No report for current month.
[2] Incomplete.
[3] Only cases of syphilis in the infectious stage are reported.
[4] Reported by Jefferson Davis Hospital.
[5] No report during present fiscal year.
[6] Reported by social hygiene clinic.

WEEKLY REPORTS FROM CITIES

City reports for week ended May 7, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	174	151	55	6,995	711	2,354	21	427	27	1,418	
Current week	109	89	38	7,470	497	1,640	32	374	37	1,307	
Maine:											
Portland	0		0	2	3	2	0	0	0	8	29
New Hampshire:											
Concord	0		0	0	0	1	0	0	0	0	6
Manchester	0		0	0	1	4	0	1	0	0	22
Nashua	0		0	0	0	0	0	0	0	0	8
Vermont:											
Barre	0		0	0	0	0	0	1	0	0	3
Burlington	0		0	0	0	0	0	0	0	1	10
Rutland	0		0	0	0	0	0	0	0	0	3
Massachusetts:											
Boston	0		2	109	23	113	0	8	2	25	224
Fall River	0		0	0	3	4	0	1	0	8	20
Springfield	0		0	23	0	5	0	1	0	9	30
Worcester	1		0	1	5	20	0	2	0	15	55
Rhode Island:											
Pawtucket	0		0	0	0	1	0	3	0	0	22
Providence	0		3	0	8	9	0	2	0	16	54
Connecticut:											
Bridgeport	1		0	0	0	6	0	0	0	0	28
Hartford	0		0	2	2	25	0	1	0	2	48
New Haven	0	1	0	4	1	1	0	0	0	10	34
New York:											
Buffalo	0		1	8	13	42	0	5	0	10	154
New York	35	6	2	2,097	95	331	0	76	3	308	1,437
Rochester	0	2	0	22	6	24	0	0	0	1	72
Syracuse	1		0	51	3	3	0	0	0	8	53
New Jersey:											
Camden	1		0	33	3	5	0	0	0	8	37
Newark	0		0	14	6	8	0	6	0	50	101
Trenton	0		0	1	5	8	0	4	0	1	44
Pennsylvania:											
Philadelphia	3	13	5	838	35	116	0	29	1	32	483
Pittsburgh	6	5	5	89	10	38	0	9	2	16	148
Reading	0		0	8	5	2	0	0	0	0	25
Scranton	0			10		5	0		0	0	

City reports for week ended May 7, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Ohio:											
Cincinnati	8	------	0	3	7	12	0	6	0	5	106
Cleveland	1	18	0	275	8	55	0	15	4	58	180
Columbus	1	1	1	56	2	11	0	3	0	3	62
Toledo	0	------	0	123	5	17	0	8	0	8	61
Indiana:											
Anderson	0	------	1	78	1	2	2	1	0	1	13
Fort Wayne	0	------	0	12	3	8	0	1	0	1	26
Indianapolis	2	------	0	286	10	14	0	2	0	0	98
South Bend	0	------	0	117	0	2	0	0	0	0	8
Terre Haute	0	------	0	4	0	3	1	0	0	0	24
Illinois:											
Alton	0	------	0	1	0	4	0	0	0	1	1
Chicago	9	2	0	565	37	202	0	44	5	63	659
Elgin	0	------	0	9	2	6	0	0	0	3	10
Moline	0	------	0	4	0	8	0	0	0	1	7
Springfield	0	------	0	12	0	3	0	0	0	2	21
Michigan:											
Detroit	2	------	0	588	11	136	1	14	0	105	235
Flint	0	------	0	133	4	42	0	4	0	19	24
Grand Rapids	0	------	0	136	0	10	1	0	0	2	26
Wisconsin:											
Kenosha	0	------	0	67	0	2	0	0	0	0	6
Madison	1	------	0	247	0	5	0	0	0	14	18
Milwaukee	0	------	0	93	3	30	0	2	1	63	106
Racine	0	------	0	267	1	4	0	0	0	9	10
Superior	0	------	0	7	0	1	0	0	0	0	8
Minnesota:											
Duluth	0	------	0	5	0	4	0	0	0	7	20
Minneapolis	1	------	0	199	7	16	7	4	0	8	90
St. Paul	0	------	0	5	3	15	0	0	0	1	66
Iowa:											
Cedar Rapids	0	------	--------	8	-------	2	0	-------	0	3	--------
Davenport	0	------	--------	1	-------	8	0	-------	0	0	--------
Des Moines	0	------	0	12	0	17	8	0	0	0	18
Sioux City	0	------	--------	40	-------	7	0	-------	0	4	--------
Waterloo	0	------	--------	59	-------	4	0	-------	0	7	--------
Missouri:											
Kansas City	1	------	2	19	5	14	1	8	0	1	90
St. Joseph	0	------	0	10	1	0	0	0	0	0	11
St. Louis	8	------	1	4	5	64	0	13	0	1	168
North Dakota:											
Fargo	0	------	1	3	1	0	0	0	0	3	9
Grand Forks	0	------	--------	30	-------	1	0	-------	0	0	--------
Minot	0	------	0	7	0	0	2	0	0	1	8
South Dakota:											
Aberdeen	1	------	--------	0	-------	1	0	-------	0	11	--------
Sioux Falls	0	------	0	0	0	0	0	0	0	0	9
Nebraska:											
Lincoln	1	------	--------	5	-------	4	0	-------	0	2	--------
Omaha	0	------	0	197	8	0	0	3	0	0	54
Kansas:											
Lawrence	0	------	0	37	0	0	0	0	0	0	2
Topeka	0	------	0	198	0	1	0	0	0	21	13
Wichita	2	1	1	28	8	1	0	0	0	6	18
Delaware:											
Wilmington	0	------	0	3	1	4	0	0	0	1	26
Maryland:											
Baltimore	0	7	2	23	19	63	0	13	0	43	234
Cumberland	0	------	0	7	2	0	0	0	0	0	9
Frederick	0	------	0	0	0	0	0	0	0	0	2
Dist. of Col.:											
Washington	0	2	2	8	9	20	0	7	1	5	159
Virginia:											
Lynchburg	1	------	0	4	1	3	0	0	0	2	12
Norfolk	0	5	0	36	3	8	0	0	0	2	29
Richmond	2	------	0	96	7	0	0	1	0	0	53
Roanoke	0	------	0	8	1	1	0	0	0	4	16
West Virginia:											
Charleston	0	------	0	1	1	0	0	2	0	0	12
Huntington	1	------	--------	1	-------	1	0	-------	0	0	--------
Wheeling	0	------	0	83	0	8	0	1	1	8	15
North Carolina:											
Gastonia	0	------	--------	55	-------	0	0	-------	0	8	--------
Raleigh	0	------	0	69	1	0	0	0	0	13	5
Wilmington	0	------	0	32	2	0	0	1	1	24	14
Winston-Salem	1	------	0	20	0	1	0	0	0	86	12

City reports for week ended May 7, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
South Carolina:											
Charleston	1	7	0	2	3	0	0	1	4	0	24
Florence	0	------	0	6	2	0	0	0	0	0	7
Greenville	0	------	0	5	1	0	0	0	0	11	5
Georgia:											
Atlanta	0	8	2	10	13	1	0	4	0	27	85
Brunswick	0	------	0	15	0	0	0	0	0	0	3
Savannah	1	1	0	20	0	2	0	1	0	4	33
Florida:											
Miami	0	2	0	16	2	2	0	0	0	3	26
Tampa	1	1	0	66	1	2	0	1	0	0	26
Kentucky:											
Ashland	0	------	--------	3	-------	0	0	-------	0	1	--------
Covington	2	------	0	3	1	1	0	0	1	1	9
Lexington	0	------	0	2	2	2	0	2	0	2	22
Louisville	2	------	0	99	4	11	0	7	0	12	85
Tennessee:											
Knoxville	0	------	0	35	8	5	0	2	0	2	30
Memphis	0	2	1	9	1	3	0	4	2	0	71
Nashville	0	------	0	36	5	8	0	0	0	10	45
Alabama:											
Birmingham	0	4	1	18	6	2	0	4	1	4	74
Mobile	0	------	1	7	3	0	0	2	1	0	--------
Montgomery	0	------	--------	51	-------	0	0	-------	0	5	--------
Arkansas:											
Fort Smith	0	------	--------	2	-------	4	0	-------	0	0	--------
Little Rock	0	------	0	2	3	0	0	1	0	3	6
Louisiana:											
Lake Charles	0	------	0	0	2	0	0	0	0	0	5
New Orleans	7	4	1	7	6	2	1	8	3	1	136
Shreveport	1	------	0	9	4	2	0	0	0	0	30
Oklahoma:											
Oklahoma City	1	------	0	0	6	0	0	1	0	0	52
Texas:											
Dallas	1	1	1	13	7	11	0	3	0	18	84
Fort Worth	0	------	1	1	3	2	0	0	0	12	26
Galveston	0	------	0	0	1	0	0	1	0	0	21
Houston	4	------	0	0	8	4	5	5	3	1	90
San Antonio	0	------	2	0	3	0	0	8	0	0	64
Montana:											
Billings	0	------	0	0	2	0	0	0	0	1	6
Great Falls	0	------	0	1	0	3	1	0	0	10	12
Helena	0	------	0	1	0	1	0	0	0	0	2
Missoula	0	------	0	0	1	0	0	0	1	0	7
Idaho:											
Boise	0	------	0	0	0	6	4	0	0	0	5
Colorado:											
Colorado Springs	0	------	0	1	0	1	0	0	0	2	11
Denver	5	------	0	100	8	14	1	7	0	9	85
Pueblo	0	------	0	5	3	2	0	0	0	7	18
New Mexico:											
Albuquerque	0	------	0	1	1	0	0	3	0	5	14
Utah:											
Salt Lake City	0	------	1	131	5	6	0	3	0	7	43
Washington:											
Seattle	1	------	0	0	7	2	0	7	0	46	117
Spokane	0	------	0	2	3	1	0	0	1	4	37
Tacoma	0	------	0	1	3	4	1	0	0	5	21
Oregon:											
Portland	0	3	0	10	7	14	3	1	0	1	85
Salem	0	2	--------	0	-------	0	1	-------	0	0	--------
California:											
Los Angeles	5	8	0	52	8	56	8	19	0	32	323
Sacramento	0	------	0	22	4	0	0	2	0	40	28
San Francisco	0	------	0	1	10	9	0	9	0	57	131

City reports for week ended May 7, 1938—Continued

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
New York:			
New York	3	1	2
Pennsylvania:			
Pittsburgh	1	0	0
Scranton	1	1	0
Indiana:			
Indianapolis	0	1	0
Illinois:			
Chicago	1	0	0
Michigan:			
Detroit	1	0	0
Wisconsin:			
Milwaukee	0	0	1
Minnesota:			
St. Paul	1	0	0
Missouri:			
St. Louis	1	0	0
Maryland:			
Baltimore	2	1	0
District of Columbia:			
Washington	1	0	0
Georgia:			
Atlanta	1	1	0
Kentucky:			
Louisville	1	0	0
Alabama:			
Birmingham	4	0	0
Arkansas:			
Little Rock	0	1	0
Texas:			
Houston	1	0	0
New Mexico:			
Albuquerque	0	0	1
Washington:			
Seattle	1	0	0
Oregon:			
Portland	1	0	0
California:			
Los Angeles	1	1	0

Encephalitis, epidemic or lethargic.—Cases: New York, 1; San Francisco, 1.

Pellagra.—Cases: Charleston, S. C., 3; Atlanta, 2; Savannah, 3; Louisville, 2; Los Angeles, 1.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—2 weeks ended April 9, 1938.—During the 2 weeks ended April 9, 1938, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia[1]	New Brunswick[2]	Quebec[3]	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis				2	8			1		11
Chickenpox		19	7	551	586	116	58	14	260	1,611
Diphtheria		9	3	61	6	6	2	1		88
Dysentery				1	1					2
Erysipelas		2		24	4	5	1	3	2	41
Influenza		58		30	85	4			68	245
Measles	1	28	1	498	1,069	2	4	22	51	1,676
Mumps		21	2		334	367	22	19	44	809
Paratyphoid fever		1						1		2
Pneumonia	5	13			64		6		27	115
Poliomyelitis						1		1		2
Scarlet fever		29	6	260	190	29	69	67	74	724
Smallpox								7		7
Trachoma									1	1
Tuberculosis	4	31	8	100	103	35	17	5	49	332
Typhoid fever		1		50	8	2		1	6	68
Undulant fever				2	4	3				9
Whooping cough		16	6	108	206	39	4		83	522

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[1] 2 weeks ended Apr. 13, 1938.
[2] 1 week ended Apr. 2, 1938.
[3] 2 weeks ended Mar. 26, 1938.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following table must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths; P, present]

Place		Sept. 26–Oct 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29 1938	Week ended—												
						February 1938				March 1938				April 1938				
						5	12	19	26	5	12	19	26	2	9	16	23	30
China:																		
Canton	C	14																
Hangchow	C	[1]41																
Hong Kong	C	84	7		2													
	D	63	7		1													
Kwangchow Wan	C	62	12															
	D	26	10															
Macao	C	27	2															
Manchuria:																		
Dairen	C	6																
Mukden	C	2																
Nanking	C	120																
	D	14																
Shanghai	C	1,414	237	22	3													
Swatow	C	44	101	2														
Tientsin	C	8																
Dutch East Indies: Macassar	C				1										[2]1			
India	C	11,344	6,502	5,326	9,330	1,772	1,783	1,635	1,528	1,765	2,718	3,401						
	D	5,787	3,737	2,614	4,602	920	933	818	822	871	1,285	1,514						
Allahabad	C									1		1	2	2			3	3
Assam	C	59	87	139	262	34	44	36	29	61	57	77	103	136	258	196	182	166
	D	25	53	56	141	15	28	23	14	28	32	38	40	60	125	100	94	90
Bassein	C										1			[3]1	1	2		
Bombay Presidency	C	1,375	363	191	10		4			2	4	8		47				
	D	686	171	117	7		2			1	2	6		36				
Calcutta	C	83	80	69	122	45	60	72	49	68	118	184	204	158	134	122	128	92
Central Provinces and Berar	C	860	356	113	40	3	14	14	25	10	10	61	132	267	769	643	963	1,397
Chittagong	C							1		1					[3]2			3
Delhi	C		1											1	1	1	22	4
Madras Presidency	C	826	1,204	2,654	3,914		452	236	269	251	231	154						
	D	389	431	1,178	1,804		236	111	119	127	123	83						

		100	255	100	120	4	3	4	5		2	1		1			4	4
	D	43	34	40	29	2	2		2		2						1	3
Negapatam	C	1																
Northwest Frontier Province	C	19																1
Orissa Province	C	147	91	39	77	3	23	19	37	29	20	31	22	29	54	56		
Punjab	C													[3]2	2	23	457	
Rangoon	C		1		2								1					
Sind State	C															1		1
Larkana	C														[4]1			
Vizagapatam	C								1									
India (French):																		
Chandernagor Territory	C	4	4	1	7	6	4				1	4						
Karikal Province	C				1	2	2						8					
Pondichery Province	C	1		1	3					16	10	1						
Indochina (French):																		
Annam Province	C	37	364	91	63	61	151	72	54	1	2	4	6		81	65	76	229
Tonkin Province	C	4,179	2,342	509	59	12	27	2	14	1	8	29	17	88	109	121	425	300
Haiphong	C	577	44	1											1			
	D	159	27															
Hanoi	C	281	361	39	3							10	7	58	17	13	39	48
Japan:[5]																		
Hiroshima	C	5																
Kobe	C	1																
Okayama Prefecture	C	5																
Taku	C	3																
Tokuyama	C	10																
Tokyo	C	1																
Siam:																		
Bangkok	C	2																
Provinces	C	7				3												

On vessels:

S. S. *Kiungchow* at Hong Kong from Shanghai	3 cases	Oct. 3, 1937
S. S. *Ranee* at Calcutta from Port Said and Blyth	1 case	Dec. 31, 1937
S. S. *Karoa* at Rangoon from Calcutta	1 case	Mar. 21, 1938
S. S. *Tsushima Maru* at Calcutta from Japan	1 case	Apr. 16, 1933

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[1] For 2 weeks.

[2] El Tor strain.

[3] Imported.

[4] Suspected.

[5] A report states that up to Sept. 30, 1937, cholera was reported in Japan as follows: Hiogo Prefecture, 1 case, 1 death; Hiroshima Prefecture, 40 cases, 14 deaths; Yamaguchi Prefecture, 2 cases, 1 death.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE[1]

[C indicates cases; D, deaths; P, present]

Place		Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29, 1938	Week ended—												
						February 1938				March 1938				April 1938				
						5	12	19	26	5	12	19	26	2	9	16	23	30
Belgian Congo	C	[3]2		2								4		4				
Bolivia:																		
Chuquisaca Department	C				2				35									
Sucre	C				1													
Santa Cruz Department	C							[3]1					[3]1					
Tarija Department	C				54			3										
Brazil. (See table below.)																		
British East Africa:																		
Kenya	C	15	10			1		1	2			1		2	2			
Uganda	C	51	67	38	39	2	7	4	11		7	7		1				
	D	40	56	30	39	2	7	4	11		7	7		1				
Ceylon:																		
Colombo	C	1	1	1	1		1		1		1							1
	D	1	1	1	1		1		1									
Plague-infected rats		3								2	3							2
China:[4]																		
Dutch East Indies:																		
Java and Madura	C	223	311	247	297	63	89											
	D	220	311	247	296	59	90											
Pasoeroean (vicinity of)	C		5	2	2			1	2									
Ecuador:																		
Chimborazo Province—Chimbo	C									10								
Colimes	C				1													
Guayaquil	C	2		2	4	2			3	2	1	2		7	1			3
	D	2		1	2	2				3		1		4	1			3
Plague-infected rats		2	3	2			3				1		1					
Parroquia Eloy Alfaro	C		1															
Egypt:																		
Asyut Province	C		1		1										[3]1			
Beheira Province	C			1														
Gharbiya Province	C				1													
Girga Province	C	1																
Hawaii Territory:[5] Plague-infected rats:																		
Hawaii Island—Hamakua District:																		
Hamakua Mill Sector		3	4	8	1	1		1										
Kukaiau														2				

Paauhau Sector		1	5	2	8		2	1		1	2			2	1	1		3
Paauilo				18														
Pohakea Sector															1			
Maui Island:																		
Makawao District—Plague-infected rats				6														
Omaopio:[5]																		
Wailuku District—Puunene	D				1													
India	C	1,996	1,874	446	1,968	545	707	851	1,379	557	1,148	1,003						
	D	821	742	658	965	202	322	435	623	348	576	618						
Allahabad	C				1					1					1			
Bassein	C				2	1			1				1	1				
Bombay Presidency	C	82	59	51	24		7			13	11	8	15	17				
	D	48	36	37	13		2			6	9	2	11	9				
Central Provinces and Berar	C	582	592	390	486	232	190	156	260	98	413	225	570	259	250	176	93	43
Cochin	C		1															
Madras Presidency	C	80	175	160	330		54	64	39	21	5	19	24					
	D	41	84	84	174		30	24	15	15	1	10	10					
Mandalay	C				43						79		42					
	D				41						73		42					
Punjab	C											1						
Rangoon	C					1	[6] 1		1	2			2		1			
	D					1	1		1		1		1			1		
Plague-infected rats												1						
Iraq: Baghdad—Plague-infected rats					1													
Madagascar. (See table below.)																		
Niger Territory. (See table below.)																		
Peru. (See table below.)																		
Tunisia: Tunis: Plague-infected rats				1				1		1								
Union of South Africa	C	[7] 1			[7] 1		[7] 6		[7] 7						[7] 4			
Cape Province—Port Elizabeth	C															8		
	D													3				
United States:[8]																		
California:[8 9 10]																		
Fresno County[9]—Plague-infected fleas.																		
Placer County[10]—Plague-infected fleas.																		
Santa Cruz County—																		
Plague-infected fleas.																		
Plague-infected ground squirrels																1		
Nevada:[8] Clark County—Plague-infected fleas.																		

[1] Including plague in the United States and its possessions.

[2] Includes 1 case of pneumonic plague.

[3] Pneumonic.

[4] Information dated May 9, 1938, states that an outbreak of bubonic plague has occurred in Kochow District, and on Hainan Island, China.

[5] During the week ended Nov. 20, 1937, plague infection was proved in 10 rats by mass inoculation in Omaopio, Makawao District, Maui Island, Hawaii Territory.

[6] Imported.

[7] For 2 weeks.

[8] Plague infection proved in insect hosts as follows: *California*—Fresno County, Oct. 7–Nov. 5; Santa Cruz County, Feb. 3–Apr. 13, 1938; *Nevada*—Clark County, Apr. 14–22, 1938; *Oregon*—Baker County, Apr. 23, 1938; *Washington*—Adams County, Mar. 7–30, 1938.

[9] For 5 weeks ended Nov. 6, plague infection proved in pooled tissue from squirrels, chipmunks, and mice in Fresno County, Calif.

[10] For the week ended Oct. 9, plague infection proved in pooled tissue from squirrels, chipmunks, and rats, and week ended Oct. 30, pooled tissue from squirrels in Placer County, Calif.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

]C indicates cases; D, deaths; P, present[

Place	Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29, 1938	Week ended—												
					February 1938				March 1938				April 1938				
					5	12	19	26	5	12	19	26	2	9	16	23	30
United States—Continued.																	
Oregon:[8] Baker County—																	
Plague-infected fleas.																	
Plague-infected ground squirrels																2	
Washington:[8]																	
Adams County—																	
Plague-infected fleas and lice.																	
Plague-infected ground quirrels										1							
Lincoln County—Plague-infected ground squirrels														2			
On vessel: S. S. *Ville de Tamatave* at Beirut C													1				

Place		October 1937	November 1937	December 1937	January 1938	February 1938	March 1938
Brazil:[11] Pernambuco State	C		5				
Madagascar (central region)	C	59	67	57	69	70	
	D	59	65	56	65	56	
Niger Territory	C		85	60			26

Place		October 1937	November 1937	December 1937	January 1938	February 1938	March 1938
Peru	C	9	12	6	7	10	
Ancash Department	C		3				
Lambayeque Department	C	1			1	2	
Libertad Department	C	2	1			1	
Lima Department	C	6	8	6	6	7	

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[8] Plague infection proved in insect hosts as follows: *California*—Fresno County, Oct. 7–Nov. 5; Santa Cruz County, Feb. 3–Apr. 13, 1938; *Nevada*—Clark County, Apr. 14–22, 1938; *Oregon*—Baker County, Apr. 23, 1938; *Washington*—Adams County, Mar. 7–30, 1938.

[11] For the year 1937, 35 cases of plague with 15 deaths were reported in Brazil as follows: Bahia State, 5 cases, 5 deaths; Ceara State, 2 cases; Parahyba State, 5 cases, 1 death; Pernambuco State, 23 cases, 9 deaths. Information dated Apr. 19, 1938, states that since Mar. 25, 4 deaths from bubonic plague have been reported in the Novo Exu District, Pernambuco State, Brazil.

SMALLPOX

[C indicates cases; D, deaths; P, present]

Place		Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29, 1938	Week ended— February 1938				March 1938				April 1938				
						5	12	19	26	5	12	19	26	2	9	16	23	30
Algeria:																		
Algiers Department	C	1																
Constantine Department	C						1											
Angola. (See table below.)																		
Argentina. (See table below.)																		
Belgian Congo. (See table below.)																		
Bolivia. (See table below.)																		
Brazil. (See also table below):																		
Bahia (alastrim)	C	11	6	9														
Santos	C		1															
British East Africa: Tanganyika	C		223		1	127	10		53					17				
Canada:																		
Alberta	C				2				[1] 3				[1] 8		[1] 7		[1] 2	
British Columbia	C				[1] 1		[1] 1											
Nova Scotia—Halifax	C											1	2					
Quebec	C		[1] 1															
Saskatchewan	C				[1] 1		[1] 6		[1] 7									
China:																		
Canton [2]	C		1	2	33	16	23	19	21	19	30	17	32					
Dairen	C		1					1				1						
Foochow	C	P	P	P														
Hankow	C				2	1	2						1	1				
Hong Kong	C	1	6	13	255	101	156	222	162	185	214	236	131	162	128	56	115	
	D				107	88	83	199	132	183	128	192	131	112	107	56	75	
Macao	C						2							1	1	1	2	3
Shanghai	C			1	7	1		6	3	4	1	2	2	2	6	3		
Tientsin	C			1														
Colombia (see also table below): Barranquilla	D	2																
Ecuador: Guayaquil	C	13	4	3	4				1						1			
Egypt: Port Said	C								3	1	5			4	2			
Eritrea	C	52	16		8	4	3			[3] 14								
France. (See table below.)																		

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[1] For 2 weeks.

[2] A report dated Feb. 12, 1938, states that for the 3 weeks ended Feb. 12, 100 cases of smallpox were admitted to hospitals in Canton, China.

[3] For 3 weeks.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec 26, 1937–Jan. 29, 1938	Week ended—												
						February 1938				March 1938				April 1938				
						5	12	19	26	5	12	19	26	2	9	16	23	30
Great Britain: England and Wales—																		
Chester County	C		1															
Kent County—Gravesend	C											2	1					
Leighton Buzzard	C									2								
Port of London	C												1					
Greece. (See table below.)																		
India	C	1,750	1,804	3,930	9,248	2,328	2,312	2,203	3,163	2,692	2,920	3,307						
	D	429	408	958	2,645	570	547	629	821	673	713	750						
Allahabad	C				1									1			1	
Assam	C	45	37	56	95	18	19	15	38	38	34	57	18	29	66	48	24	57
Bassein	C				1											1		
Bombay Presidency	C	154	130	570	1,130	523	607	531	731	834	812	753	983	743				
	D	33	41	165	316	150	161	173	190	177	169	185	199	138				
Bombay	C	41	73	209	690	222	249	233	246	264	234	212	104	142	130	91	95	
	D	23	30	119	350	125	132	146	142	129	135	127	100	83	65	65	51	
Calcutta	C	20	24	69	235	56	106	120	149	194	185	261	208	147	228	123	127	143
	D	14	13	43	177	27	77	76	93	132	106	166	161	107	164	115	91	97
Cawnpore	C				14	5	4	4	5	2	1	4	6	4	7	6	5	9
Central Provinces and Berar	C	26	7	15	51	39	46	55	90	53	83	38	75	124	117	110	92	64
Chittagong	C				3			1			2		2	1				
Delhi	C	1		6	9	6	1	5	1	3		3	5	3	3	7	4	9
Karachi	C		2	4	18		4	6	2	2	4	6	5	2	3		5	11
Madras Presidency	C	301	213	215	899		245	221	218	182	195	204	184					
	D	51	26	51	172		50	41	38	29	37	31	28					
Madras	C	74	50	88	359	76	71	58	43	52	64	69	64	58	57	46	42	38
Negapatam	C						6				2	4	2	3		7	1	
Northwest Frontier Province	C	154	380	417	748	32	39	46	43	29	31	34	61	8	14		10	54
Orissa Province	C	193	206	353	831	198	188	248	306	224	303	318	446	278	357	149		
Punjab	C	162	404	1,035	1,641	250	181	281	240	249	149	201	237	104	63	146	106	
Rangoon	C	3	5	6	66	12	16	5	9	21	23	24	9	6	4	4	8	
Sind State	C	78	164	436	643	127	64	124	167	79	180	159	104	172	194	121	158	199
Vizagapatam	C									1		1		1	1			
India (French):																		
Chandernagor Territory	C									1								
Karikal Province	C									1								

Indochina (French) (see also table below):																		
Tonkin Province	C	------	------	26	135	135	130	160	282	116	195	227	137	------	251	188	222	------
Haiphong	C	------	2	36	169	45	52	27	24	12	9	19	5	------	15	2	8	------
Hanoi	C	------	------	1	5	3	8	------	4	2	3	8	3	------	18	4	9	------
Saigon-Cholon	C	------	------	------	1	------	------	1	------	------	------	------	1	------	------	1	------	------
Iran	C	------	2	------	4	6	------	------	------	------	------	------	2	------	------	------	------	------
Iraq	C	------	------	------	13	------	------	------	8	------	------	------	------	------	------	1	------	------
Baghdad	C	------	------	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------
Mexico (see also table below):																		
Chihuahua	C	------	------	------	------	------	------	------	------	------	1	------	------	------	------	------	------	------
Durango	D	1	------	------	------	1	------	------	1	2	------	------	------	------	------	1	------	------
Mexico, D. F	C	5	11	2	2	------	3	------	------	------	1	1	------	------	------	------	------	------
Monterrey	C	------	1	1	5	------	------	1	------	------	------	------	------	------	------	------	1	1
San Luis Potosi	D	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Torreon	C	------	------	2	7	------	------	------	------	------	------	------	------	------	------	------	------	------
	D	5	4	7	4	1	------	1	------	------	------	------	------	------	------	------	------	------
Vera Cruz	C	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Morocco. (See table below.)																		
Nigeria	C	156	29	136	104	------	57	------	------	------	------	------	------	------	------	------	------	------
Lagos	C	------	------	------	------	------	------	------	------	------	1	------	2	1	2	------	------	------
Nyasaland	C	31	11	3	3	------	------	------	------	------	------	------	------	------	------	------	------	------
Panama Canal Zone: Colon	C	2	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Portugal (see also table below):																		
Lisbon	C	3	3	2	4	1	------	1	2	5	5	1	1	------	------	------	------	1
Portuguese East Africa. (See table below.)																		
Salvador. (See table below.)																		
Siam	C	------	------	------	76	------	------	------	26	67	------	8	9	------	------	1	2	------
Sierra Leone	C	10	------	------	------	------	------	------	[1] 4	------	[1] 4	------	------	------	------	------	------	------
Southern Rhodesia	C	4	121	114	13	2	16	3	------	2	5	------	------	------	------	------	------	------
Straits Settlements: Singapore	C	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------	1
Sudan (Anglo-Egyptian)	C	64	88	64	282	22	25	9	7	34	2	18	4	18	12	3	7	19
Union of South Africa. (See table below.)																		
Venezuela: Puerto Cabello.[6]																		

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[1] For 2 weeks.

[4] Imported.

[6] A report dated Feb. 10, 1938, states that 16 cases of smallpox were reported in Puerto Cabello; information dated Feb. 21, states that 4,000 cases of smallpox (alastrim) were reported in Barquisimeto, Lara State, Venezuela, and that smallpox is present from Barquisimeto to Valencia and Maracay.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

On vessels:

S. S. *Castalia* at Suez from Karachi and Bombay	1 case	Oct. 5, 1937
S. S. *Egra* at Rangoon from Calcutta	1 case	Nov. 16, 1937
S. S. *Anhui* at Singapore from Hong Kong	1 case	Jan. 19, 1938
S. S. *Rizwani* at Kamaran	1 case	Jan. 19, 1938
S. S. *Tai Seun Heng* at Sandakan from Hong Kong	1 case	Jan. 23, 1938
S. S. *Suisang* at Penang from Hong Kong and Singapore	1 case	Jan. 26, 1938
S. S. *Hong Siang* at Singapore from Amoy, Swatow, and Hong Kong	1 case	Jan. 26, 1938
S. S. *Trave* at Singapore from Hong Kong	1 case	Jan. 27, 1938
S. S. *Muinam* at Singapore from Hong Kong	1 case	Jan. 29, 1938
S. S. *Tatsuta Maru* at Honolulu	1 case	Feb. 4, 1938
S. S. *Circassia* at Aden from Bombay	1 case	Feb. 16, 1938
S. S. *Chantala* at Akyab from Chittagong	1 case	Feb. 18, 1938
S. S. *Empress of Japan* at Honolulu	1 case	Feb. 21, 1938
S. S. *Tilawa* at Singapore from Hong Kong	1 case	Feb. 21, 1938
S. S. *Seringa* at Calcutta from Port Said	1 case	Feb. 24, 1938
S. S. *Yuen Sang* at Singapore from Hong Kong	1 case	Feb. 28, 1938
S. S. *Cathay* at London	1 case	Mar. 4, 1938

On vessels—Continued.

S. S. *City of Auckland* at Halifax from Calcutta	1 case	Mar. 5, 1938
S. S. *Kaisar-I-Hind* at Yokohama from Hong Kong	3 cases	Mar. 6-7, 1938
S. S. *Van Heutsz* at Singapore from Amoy, Swatow, and Hong Kong	1 case	Mar. 9, 1938
S. S. *Hai Hing* at Singapore from Amoy, Swatow, and Hoihow	1 case	Mar. 9, 1938
S. S. *Netuka Maru* at Moji from Dairen	1 case	Mar. 11, 1938
S. S. *Norviken* at Singapore from Hong Kong and Swatow	1 case	Mar. 13, 1938
S. S. *Kum Sang* at Singapore from Kobe, Amoy, and Hong Kong	1 case	Mar. 16, 1938
S. S. *Haruna Maru* at Kobe from Hong Kong	1 case	Mar. 16, 1938
S. S. *Hinsang* at Sandakan from Hong Kong	2 cases	Mar. 22-24, 1938
S. S. *Kiturin Maru* at Moji from Dairen	1 case	Mar. 31, 1938
S. S. *Sirdhana* at Singapore from Kobe, Amoy, and Hong Kong	1 case	Apr. 1, 1938
S. S. *Prosper* at Singapore from Hong Kong and Swatow	2 cases	Apr. 3, 1938
S. S. *Strithaird* at Fremantle	2 cases	Apr. 7, 1938

Place		October 1937	November 1937	December 1937	January 1938	February 1938	March 1938
Angola	C			7	19	29	
Argentina	C	3	1				
Belgian Congo	C	352	166	292	251	336	
Bolivia:							
Cochabamba Department	C					[6]4	
La Paz Department	C					[6]11	9
Potosi Department	C					[6]5	2
Santa Cruz Department	C					[6]5	
Tarija Department	C						1
Brazil: Puerto Alegre	C	4	2				
France	C		2				
Greece: Salonika	C		3	7	10	1	7
Indochina (French) (see also table above)	C	147	197	319	694	864	1,258
	D	28	43	91	188	189	237
Mexico (see also table above):							
Chiapas State	C					1	
Chihuahua State	C		21				
Coahuila State	C		17				
Durango State	C		17				
Guanajuato State	C		38				
Mexico—Continued.							
Mexico State	C		3			1	
Mexico, D. F	C	5	17		8	4	
Michoacan State	C		59				
Nayarit State	C						
Nuevo Leon State	C		6				
Queretaro State	C	1	2			4	
Sinaloa State	C						
Tabasco State	C		1				
Tlaxcala State	C		3				
Vera Cruz State	C	1	25				
Yucatan State	C		1				
Zacatecas State	C		7				
Morocco	C	1	2				
Portugal (see also table above)	C	53	52	18	62	13	
	D	4	4	3	2		
Portuguese East Africa	C		8				
Salvador	C				16	2	
Union of South Africa:							
Cape Province	C			42			
Transvaal	C			41			

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[6] For January and February.

TYPHUS FEVER

[C indicates cases; D, deaths; P, present]

Place		Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Week ended—															
					January 1938					February 1938				March 1938				April 1938		
					1	8	15	22	29	5	12	19	26	5	12	19	26	2	9	16
Algeria:																				
Algiers Department	C	38	89	13				13	11	8	5	5	11	15	36	13	13	16	13	4
Algiers	C	15								2		1	6	1	2					
Constantine Department	C	47	23	81	21		[1] 26	50	20	13	46	15	24	12	59	26	45	65	33	25
Bone	C	1		1					2		1		1							
Constantine	C	7						1		4	20		14	4			29	20		
Philippeville	C	2	1							1	1									
Oran Department	C		16	22	1		[1] 3		1	6	2	3	2	2		1	4	1	3	6
Southern Territories	C		2	1					1	13	1	1	2		13					
Australia: Brisbane	C						1									1				
Basutoland	C	3																		
Bolivia. (See table below.)																				
British East Africa: Kenya	C						1													
Bulgaria	C	13		5		14	1	3	6		2								1	1
Chile	C	305	286	196		25	24	17	19	11										
Antofagasta Province	C		4																	
Concepcion Province	C	4	2	1																
Iquique	C		1	1																
Linares Province	C	2	12	3		1	1						2							
Malleco Province	C	4	3	3																
Nuble Province	C	24	19	19		2	7		4	1	1	1	7	5						
Santiago Province	C	230	223	157		19	11	14	15	9	4	9	8	12						
Valparaiso	C	16	5	1		1	2	1	2		1		1	2		1		1		
China (see also table below):																				
Canton	C	3																		
Dairen	C	1	2	1																
Hankow	C	2							1	1										
Harbin	C							1												
Shanghai	C					1									2	8	16	58	27	
Swatow	C																			
Tientsin	C	1	7	4	1															

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[1] Suspected.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER—Continued

Place		Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec 25, 1937	Week ended—															
					January 1938					February 1938				March 1938				April 1938		
					1	8	15	22	29	5	12	19	26	5	12	19	26	2	9	16
Chosen. (See table below.)																				
Czechoslovakia. (See table below.)																				
Dutch East Indies: Sumatra. (See table below.)																				
Egypt:																				
Alexandria	C	4	7	3	1							1	1	1	4	3	3	2	1	4
Aswan Province	C												3			16			2	
Asyut Province	C	1					1												1	
Beheira Province	C						6	3				1	9		12	21		7	12	
Beni-Suef Province	C		1																	
Cairo	C			1	3						1	1			7	3	3	2	4	6
Dakahliya Province	C						1					30	19		17	10		7	5	
Gharbiya Province	C						3					12	2		4	1		14	8	
Minufiya Province	C							3					13		2	2		2	14	
Minya Province	C												5		8	3		2		
Qena Province	C						1								5	20		38	45	
Sharkiya Province	C											7			7	5				
Provinces	C	3	7	7	6	11	12	6	26	24	40	54	59	35	61	84	82	80	102	120
Eritrea: Asmara	C		2																	
Germany: Frankfort-on-Main	C	1																		
Great Britain—England and Wales—Gloucester County	C		1																	
Greece. (See table below.)																				
Guatemala. (See table below.)																				
Haiwaii Territory: Honolulu	C	4	1	1	1	1					1				1					
Hungary	C																			1
Iran	C			4								1								
Teheran	C											1								
Lithuania. (See table below.)																				
Mexico (see also table below):																				
Chihuahua	C		2																	
Mexico, D. F.	C	17	18	20		12	1				4	3	5	3	5	8	2			
Saltillo	D										1									
San Luis Potosi	D									1										
Tecamachalco	C				7															
Torreon	C		1						1											
Morocco (see also table below)	C	38	29	315	198	80	139	142	184	131	204	208	240	299	411	372	234	206	199	243
Casablanca	C	4		24		16	6		57	44	45	67	17	29	70	78	36	24		35

Netherlands: Rotterdam	C			[1] 1																
Nigeria	C	2																		
Palestine:																				
Haifa	C	16	5	8	2			1	1											
Jaffa	C	13	17	3			3	2		1	1	1		1	1	1				
Poland	C	53	68	141	54	98	78	87	79	112	76	93	150	145	161	207	176	130	145	125
	D	1	5	3	1	6	7	9	7	6	6	6	5	7	11	11	9	3	4	7
Portugal. (See table below.)																				
Rumania. (See table below.)																				
Sierra Leone: Freetown	C			1																
Straits Settlements: Singapore	C	1					1		1			1								
Switzerland	C	1																		
Syria: Deir-ez-Zor	C												10							
Trans-Jordan	C		1							2							3	1	1	
Tunisia:																				
Tunis	C	3	3	2	2					2		1	1	3	1		3	1	1	3
Provinces	C	132	161	57	12	26	80	62	104	37	32	83	59	100	41	75	45	57	63	
Turkey. (See table below.)																				
Union of South Africa. (See table below.)																				
Yugoslavia: Belgrade	C		1								1									
On vessels:																				
S. S. *Blackhill* at Philippeville	C							1												
S. S. *Empress of Japan* at Yokohama	C																		1	

Place		October 1937	November 1937	December 1937	January 1938	February 1938	March 1938
Bolivia:							
La Paz Department	C					[2] 18	5
Oruro Department	C					[2] 9	3
Potosi Department	C					[2] 5	8
China: Manchuria—Harbin	C				3	1	
Chosen	C	19					
Czechoslovakia	C						2
Dutch East Indies: Sumatra	C					[3] 33	
Greece	C	18	7	7			
Guatemala	C	2			3		1
Lithuania	C	6	7	2	12		49
Mexico (see also table above):							
Aguascalientes State	C		1		13		
Coahuila State	C		3				
Durango State	C		8				
Guanajuato State	C		22				
Guerrero State	C		2				
Hidalgo State	C	2	19				
Jalisco State	C		2				
Mexico State	C	19	42		8	7	

Place		October 1937	November 1937	December 1937	January 1938	February 1938	March 1938
Mexico (see also table above)—Con.							
Mexico D. F.	C	14	20		27	16	
Mexico City	D				5	4	
Michoacan State	C		11				
Oaxaca State	C		3		1		
Puebla State	C		9				
Queretaro State	C	2	2			5	
San Luis Potosi State	C	4			5	2	
Zacatecas State	C		6				
Morocco (see also table above)	C	39	47	914	638	1, 118	1, 545
Portugal	C	26	28	7	2	17	
Rumania	C	33	110	246	470	510	
Turkey	C	100	34	45	96	43	
Istanbul	C		4	2	3	10	
Union of South Africa:							
Cape Province	C	162	75	100	37	43	
Port Elizabeth	C				2	1	3
Natal	C		9	1		4	
Orange Free State	C	3	3	3	30	24	
Transvaal	C	5	1	1	12	4	

---

[1] Suspected.

[2] For January and February.

[3] Tropical typhus fever.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER

[C indicates cases; D, deaths; P, present]

Place		Sept. 26–Oct. 30, 1937	Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 26, 1937	Week ended—															
					January 1938					February 1938				March 1938				April 1938		
					1	8	15	22	29	5	12	19	26	5	12	19	26	2	9	16	23
Belgian Congo:																					
Saratumba	C													[1]1							
Zongo	C										[1]7			[1]4							
	D										4			1							
Brazil:[2]																					
Federal District	D											1		1							
Minas Geraes State	D					1	2	7	6	16	9	26	17	26	10	10	9	1	2	2	
Para State	D							1													
Rio de Janeiro State	D							1	5	3	3	2	2	3	11	10	13	4	2	1	1
Santa Catharina State	D			1						1				1		2	7	1		8	
Sao Paulo State	C										P										
	D				1			18				1				1	1	1			
Colombia:																					
Boyaca Department	D	1		1																	
Cundinamarca Department	D						1					1	1				1				
Santander Department	D	3		3																	
Dahomey: Cotonou	C			[1]5																	
French Equatorial Africa: Bangui	D						1														
Gambia: Georgetown	C						[1]1														
Gold Coast[3]	C	4	[4]8	2	5	[5]4															[1]1
	D	1	3	2																	[1]1
Keta	C				1																[1]1
Ivory Coast:																					
Abidjan	C									1		[1]1									
Agboville	C														[1]1						
Anyama	C					1															
Gaoua	C			[1]1																	
Grand Bassam	C														2						
Spao Plantations (near Bingerville)	C														2						
Touba	C	[1]1																			
Nigeria	C	5	2	[1]1	1		1		[1]1												
	D		1				1		[1]1												

Paraguay: Asuncion	C		1																		
Senegal	C	12	[6] 12	3								[1] 1									
	D		2																		
Dakar	C	[7] 1	[7] 2									[1] 1									
Diourbel	D																			[1] 1	
Rufisque	C	2	2																		
Thies	C	4	1																		
Sudan (French)	C				1																
San	C			1	1																
Toukoto	C		[1] 1																		

---

[1] Suspected.

[2] See also reports of yellow fever in Brazil in preceding issues of the PUBLIC HEALTH REPORTS for 1938 and 1937.

[3] During the week ended May 7, 1938, 1 case of yellow fever was reported in Gwaba, Gold Coast.

[4] Includes 2 suspected cases.

[5] Includes 1 suspected case.

[6] Includes 3 suspected cases.

[7] Imported.

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Natural and Artificial Lighting for Low Cost Housing
Principles Governing Sanitation of Isolated Dwellings
Tannic Acid Precipitation of Scarlet Fever Toxin
Length of Nursing Visits as Criterion of Nursing Service

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DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg Gen. ROBERT OLESEN, *Chief of Division*

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It contains (1) current information regarding the prevalance and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PUBLIC HEALTH REPORTS

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LIGHTING FOR LOW COST HOUSING*

By JAMES E. IVES, *Senior Physicist (Retired), United States Public Health Service*

INTRODUCTION

By the term "low cost housing," as used in this paper, is meant housing for families having incomes of less than $1,500 a year. At the present time from 60 to 70 percent of the families in the United States have incomes of less than this amount. Since the maximum monthly rent which a family in this group can afford to pay appears to be about $25, and the average number of persons in a family is 3 or 4, requiring a house or tenement of 4 or 5 rooms, the lighting, natural or artificial, must be of the simplest type which will fulfill the minimum hygienic requirements. It is also evident that, for the sake of economy, the greatest possible use should be made of natural lighting.

It is generally estimated that such a house, or tenement, should have, from the standpoint of hygienic considerations, a total cubic capacity of not less than 4,000 cubic feet, and should have a living room, kitchen, two or three bedrooms, and a bathroom. It is evident, however, that the space requirements must be more or less elastic and that allowance should be made for a possible increase in the size of the family. Assuming the height of the rooms to be 8 feet, a total cubic capacity of 4,000 cubic feet would give for a four-room house, or tenement, an average floor area of about 125 square feet per room. Such a house, or tenement, could house a family of four or five, consisting of two adults and three children. The number of bedrooms required would depend upon the age and sex of the children. The living room, for obvious reasons, should have a larger floor area than the kitchen or bedrooms.

Five reasons may be given why adequate illumination is desirable in a dwelling house: (1) For the protection of eyesight; (2) for promotion of cleanliness; (3) for prevention of accidents; (4) for a possible direct effect upon health; and (5) for its psychological effect. These reasons hold for both natural and artificial lighting.

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* Contribution to the Symposium on Hygiene of Housing presented at the 66th Annual Meeting of the American Public Health Association, New York, N Y , October 8, 1937.

The question as to the least illumination allowable is debatable; but information now available appears to indicate that to protect the eyes from strain where ordinary visual tasks are being performed, the illumination on the object looked at should never be less than six foot-candles (*1*, *2*, *3*). For fine visual work, such as prolonged reading or sewing, it should also be possible to obtain at certain points an illumination of at least 10 foot-candles. In a dwelling house the intensity of the illumination on all working planes, such as stoves, sinks, and kitchen and study tables, must be sufficient, and glare from light sources must be reduced to a minimum.

NATURAL LIGHTING

To provide adequate natural lighting the area of the windows should be sufficient and the windows should be properly placed. The area of the windows should be as great as possible. The maximum area allowable will be determined by the need of wall space for furniture, and by the loss of heat through the window. The minimum area allowable will be determined by the area necessary to give sufficient illumination throughout the room.

The best all-round method of evaluating the sufficiency of the daylight illumination in a room appears to be by means of the ratio of the glass area of the window to the floor area. If this ratio is large enough, and the windows are properly placed, and the view of the sky is not obstructed, the room will be well lighted. A good rule appears to be that in every room in which persons live, sleep, or congregate the total area of the glass in the windows shall be not less than 15 percent of the floor area (*4*). This is probably a reasonable rule. Since the sash holding the glass and the framework of the window will perhaps take up 15 percent or more of the total area of the window, this would mean that the total window area, including both the glass and the wooden or metal framework holding the glass, should be not less than 17 percent of the floor area.

If, considering a specific case, we assume that the living room of the house is 13 by 15 feet, the area of the floor will be 195 square feet. Seventeen percent of this area would be about 33 square feet. If the window is 5 feet 6 inches wide and 6 feet high its total area will be 33 square feet, or equal to the recommended minimum area. If the ceiling is 9 feet high and the window sill is 2 feet 6 inches above the floor, a window opening 6 feet high would bring the top of the window 6 inches from the ceiling. If the ceiling is only 8 feet high the height of the window must be less and its width must be greater. In either case the total window area may be divided between two windows. It must be remembered, however, that for a window of the same area a high window gives greater illumination than a broad one. For the same area, therefore, to obtain the greatest illumination a window should be made high rather than broad. The United States Public Health Service has shown (*5*), for instance, that doubling the height of a window approximately trebles the illumination at the middle or rear of a room, whereas doubling the width of a window does not even double the illumination. Increasing the height of a window rather than its width also gives more space for the use of furniture. The effect of glare from a window may also be considered; and we may ask in this connection, Is less glare produced by supplying the required window area with two windows rather than one, or by making a window broad rather than high?

To calculate the least permissible glass area of a window from the point of view of the least permissible illumination it is necessary to specify the least permissible illumination at a given hour of the day at a given time of the year. Thus we may ask what must be the glass area of a window to give a daylight illumination of six foot-candles, in a given locality, at a given distance from a window, at 4 p. m., on a clear day in midwinter, the ceiling and walls of the room being white. From the results of the studies made by the United States Public Health Service (*5*) the illumination coming from the sky, through a window of any given size, can be calculated. Thus it can be shown that, in Washington, D. C., at 4 p. m. on December 21, the illumination from a clear sky, on a horizontal plane 36 inches above the floor, from a window 5 feet 6 inches wide and 6 feet high, at a distance of 13 feet from the window, will be about 7 foot-candles, and that at a distance of 5 feet from the window it will be about 33 foot-candles. Since, in the latitude of Washington, 4 o'clock is about the time that artificial illumination is turned on in midwinter, a ratio of glass area to floor area of 15 percent may be considered to be sufficient if we adopt the criterion that six foot-candles is the minimum illumination allowable in the rear of the room at any time of the day or year.

The natural illumination in a room will, of course, vary with the time of day and time of year, and also with the condition of the sky, whether clear or cloudy. At noon in midsummer or midwinter the daylight within a building, due to the sky, in Washington, D. C., will be about twice as great as at 4 p. m. In midsummer, the illumination at 4 p. m. will be about twice, and at noon one and a half times as great, as in midwinter.

The orientation of the window with respect to the points of the compass will also make a difference. Windows facing north will not usually receive any direct sunlight; those facing east, west, or south will receive direct sunlight during some part of the day. In general, the entrance of direct sunlight into a room is desirable in winter, but not in summer. This is particularly true for the Southern States. Even in wintertime direct sunlight is not desirable if it falls upon the working plane. In this case window shades or awnings are used to reduce or divert some of the sunlight, and the illumination is, in general, decreased. Window shades should always be provided. The most desirable form of window shade is probably the venetian blind, since it can be used not only to reduce the illumination from direct sunlight but also to increase the illumination in the rear of the room by reflection from the slats. If the cost of a venetian blind is too great, a translucent shade of a light buff color is very serviceable. There is at the present time a great need for a cheap form of venetian blind. When such a shade is developed, there will doubtless be a great demand for it.

The direction in which the windows of a house face will depend upon the orientation of the house. In the United States, windows having a southerly exposure will receive a large amount of sunlight in the winter and a relatively small amount in the summer. Henry Niccols Wright *(6)*, who has recently studied the effect of the orientation of the house upon its heating for the John B. Pierce Foundation for Housing Research, states that, in the neighborhood of New York City, by making the windows of the living room face 25° west of south, the living room can be kept warmer in winter and cooler in summer, reducing the cost of heating and making the room more comfortable. The problem of lighting the house by daylight illumination is therefore bound up with the problem of heating it, and it is certainly desirable to orient the house so as to obtain the best results for both.

Casement windows are probably more desirable than sash windows, since they can be thrown completely open, allowing the entrance of direct sunlight with any antirachitic and germ-killing properties that it may have. In this connection it may be mentioned that it is very significant that, as the United States Public Health Service has shown *(7)*, the incidence of tuberculosis is very much greater among the farmers of southern Tennessee than it is among the tenant farmers and share croppers of southern Alabama, although the latter are not as well off as the former, and in many cases live in poverty-stricken shacks with no glass in the windows and only wooden shutters to keep out the weather. The reason for this lesser incidence of tuberculosis is unknown, but it is possible that it may have something to do with the greater ingress of sunlight into the poorer houses. It is the belief of the writer that the greatest opportunity possible should be provided for the entrance of sunlight and air into the house. As a check, however, on an exaggerated estimate of the hygienic value of sunlight, it should always be remembered that sunlight is not absolutely essential for animal life. Many animals live away from sunlight most of the time and are healthy. On the other hand, plants cannot live without sunlight; under it chlorophyll is formed, and the carbon dioxide of the air is absorbed as food. Because sunlight is necessary for the existence of plants it cannot be argued that it is essential for animals. The radiant energy of sunlight, however, does have an important effect upon the young child, and probably upon the adult.

In this connection may be considered the desirability of the use of ultraviolet-transmitting glass in the windows of dwellings. Such glass can now be obtained which transmits a large percentage of the antirachitic ultraviolet light. Ordinary window glass does not allow this ultraviolet light to pass. It may be pointed out, however, that the amount of ultraviolet light entering a window is very small, and that, unless he is very close to the window, a person will get as much ultraviolet in a few minutes out of doors as in a whole day indoors. However, the use of such glass is entirely a matter of expense; and if expense is not an important consideration, glass which transmits the ultraviolet rays may well be used.

Windows should, if possible, be placed in the middle of a wall, as this will give the best general illumination of a room. A sink in a kitchen should be so placed that the light from the window will come from the side rather than from the front, on account of the glare experienced when directly facing a window.

Window sills should be not less than 30 inches above the floor, since the upper part of the retina of the eye is more sensitive to light than the lower part, and bright light entering the eye from below this level fatigues it. The usefulness of the portion of the window below this level in providing illumination is also very small.

Porches should be so placed that they will not obstruct the daylight entering the windows. Trees and shrubs should be so planted that they will not obstruct daylight.

ARTIFICIAL LIGHTING

The maintenance of the illumination requirements specified above can be obtained only by the use of electricity. Electric light should therefore be considered a minimum requirement for the healthful American home. To provide the requisite lighting, the necessary electric current should be provided, with the necessary number of outlets, and all outlets should be placed in the most desirable positions. Convenience outlets should be so placed that floor or table lamps can be used to provide the light for reading, writing, or sewing. When the house is built, the electric wiring then installed should be heavy enough to carry all the current that may be needed for lighting or for any other purpose.

In a four-room house, No. 12 wire may be used throughout, with 15 outlets. There should be a central outlet in the ceiling of each room to provide general illumination. Besides the central outlet, there should be two convenience receptacles in the living room to supply current for lamps for reading, writing, or sewing; two duplex receptacles in the kitchen, one over the sink and one on the wall; and one convenience receptacle in each bedroom by the dresser. In the bathroom, the outlet should be over the mirror. In the kitchen, shadows on the sink and work table should be avoided, if necessary, by installing a second outlet in the ceiling.

For economy, inside frosted lamps may be used in the ceiling outlets without the use of opal glass globes, although the use of such globes is desirable to reduce glare. The ceiling outlets in the living room and kitchen may be equipped with 100-watt inside-frosted lamps, and in the bedrooms with 60-watt inside-frosted lamps. A 100-watt lamp in the ceiling of the living room or kitchen would give about 10 foot-candles directly under the lamp 3 feet above the floor. A 60-watt lamp in the ceiling of a bedroom would give five or six foot-candles under the lamp 3 feet above the floor. Higher illumination for fine visual work, such as reading, writing, or sewing, should be provided in the living room and bedrooms by means of floor or table lamps. Wall switches should be provided in the living room and kitchen. Pull chains may be used in the bedrooms and bathrooms. A liberal number of outlets should be provided when the house is built, since the cost of a few extra outlets at that time is not great.

The ceilings in all rooms should be mat white, so as to provide the greatest reflecting power and the least glare. The walls should have a mat finish and be of a light tint, having a reflecting power of at least 60 percent. A light buff or yellowish brown tint is suggested. A white ceiling and light walls increase very greatly the efficiency of a lighting unit.

To prevent accidents, an illumination of at least two foot-candles should be provided on passageways and stairways.

TENEMENTS

In the preceding discussion attention has been given primarily to the lighting of the small individual house of four or five rooms. For tenement or apartment houses, rules must also be laid down as to the minimum amount of sky visible at a window, as to the minimum width of light courts, as to the maximum height of buildings, and as to the least distance between buildings.

SUMMARY

1. A minimum illumination of six foot-candles should be provided on all working planes for general illumination. Provision should also be made for an illumination at certain points of at least 10 foot-candles for reading, writing, or sewing.

2. Glare from all light sources should be reduced to a minimum.

3. The total glass area of the windows in each room should be not less than 15 percent of the floor area of each room.

4. Windows should preferably be placed centrally in a wall.

5. Window sills should be not less than 30 inches above the floor.

6. Casement windows are to be preferred to double-hung windows.

7. Windows should be provided with shades, preferably with venetian blinds.

8. Ceilings should be mat white, and walls should be mat and of a light tint having a reflecting power of at least 60 percent. Light buff or yellowish brown is suggested for the walls.

9. Kitchen sinks should be so placed that light from a window comes from the side rather than from the front.

10. Consideration should be given to the direction, as to the points of the compass, in which windows face so as to give the most desirable conditions of lighting and heating throughout the year.

11. The electric wiring installed when the house is built should be heavy enough to carry all the current that may be needed for lighting or for any other purpose.

12. There should be an electric outlet in the center of the ceiling of each room, except in the bathroom where it should be over the mirror; two convenience outlets in the living room, and one in each bedroom, the convenience outlet in a bedroom being by the dresser; two duplex outlets in the kitchen, one over the sink and one on the wall.

13. Wall switches should be provided in the living room and in the kitchen.

14. An illumination of at least two foot-candles should be provided on passageways and stairways.

15. Porches should not be so placed as to obstruct the daylight entering windows; nor should trees and shrubs be so planted that they will have this effect.

REFERENCES

(*1*) Clark, Janet H.: Lighting in relation to public health. Williams and Wilkins Company, Baltimore, 1924.

(*2*) Tinker, Miles A.: Hygienic lighting intensities. J. Ind. Hyg., **16:** 258–262 (1935).

(*3*) McDermott, L. H.: Daylight illumination necessary for clerical work. Technical paper No. 19, Illumination Research, Department of Scientific and Industrial Research. His Majesty's Stationery Office, London, 1937.

(*4*) The President's Conference on Home Building and Home Ownership, Vol. 11, Housing Objectives and Programs, p. 174, Washington, D. C., 1932.

(*5*) Ives, Knowles, and Thompson: Studies in illumination. IV. Daylight in buildings. Pub. Health Bull. No. 218, U. S. Public Health Service. Government Printing Office, Washington, D. C., 1935.

(*6*) House and Garden, New York. January 1937.

(*7*) Lumsden and Dauer: Some features of tuberculosis mortality in the United States. Pub. Health Bull. No. 225, U. S. Public Health Service. Government Printing Office, Washington, D. C., 1936.

THE SANITATION OF ISOLATED DWELLINGS*

By H. A. Whittaker, *Director, Division of Sanitation, State Department of Health, Minneapolis, Minn.*

INTRODUCTION

The information included in this report is applicable mainly to the isolated dwelling, although some of the principles may apply equally to large installations. Where a number of individual dwellings are grouped together, or where a single structure houses a number of families, a community water supply and sewerage system should be provided. The larger community installations deserve individual consideration and are not, therefore, included in the scope of this report; nevertheless, whether the water supply or the sewerage system be large or small, principles of design and construction should be followed which will assure reasonable health safeguards.

The material on screening and ratproofing includes a very brief statement of the principles that should be followed in the construction of dwellings with respect to making them insect and rodent proof.

In the development of housing facilities in any section of the country, the department of health that has jurisdiction here should be consulted in regard to the subjects considered. This should be done before any construction work is started so that structures will not be built that do not comply with health department requirements.

WATER SUPPLY

To be satisfactory for drinking, culinary, and other domestic purposes, water should be incapable of causing discomfort or disease, and should be clear, practically free from color and odor, pleasant to the taste, and devoid of toxic salts or an excessive amount of dissolved mineral substances. It should meet the standards of the United States Treasury Department for drinking water and, likewise, the standards of the State and local departments of health that have jurisdiction.

That a water supply may be made safe from a public health point of view, there are certain fundamental principles with regard to location, construction, and operation of the supply system that should be followed. Furthermore, it is highly desirable both from the standpoint of health and convenience that the water be supplied to and distributed in the dwelling under pressure. Where water is not distributed under pressure, there are health hazards associated with conveying it from the well or other source to the dwelling and with the manner in which it may be stored in the dwelling. It is also true that, if the entire water supply of a family must be carried from the source to the dwelling, its use for domestic purposes will be much restricted.

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* Contribution to the Symposium on Hygiene of Housing presented at the Sixty-sixth Annual Meeting of the American Public Health Association, New York, N. Y., October 8, 1937.

Well-water supplies are considered in greater detail in this report than other sources of supply because it is recognized that wells will be used most frequently as sources of water supply for isolated dwellings. Surface water from lakes and streams and water collected from the roofs of buildings should not be used unless it is treated to render it safe for drinking purposes. Few, if any, mechanical methods of water purification have been developed for the general water supply of an isolated dwelling that can be operated safely by the individual home owner. For this reason, if surface water is the only supply that is available, at least that which is used for drinking purposes should be boiled.

In safeguarding well-water supplies, it is recommended that the minimum sanitary standards contained in the Progress Report of the Committee on Ground Water Supplies, Conference of State Sanitary Engineers, 1936,[1] be followed.

SEWAGE DISPOSAL

It is highly desirable from the standpoint of both health and convenience that dwellings be equipped with a water-carriage sewerage system. If a public sewerage system is not available for the discharge of sewage from a dwelling, it becomes necessary to dispose of the sewage through an independent disposal system. In some localities, however, it is difficult and even impossible to construct a satisfactory independent system, and this condition makes it imperative that a careful investigation be made before the dwelling is erected to determine the feasibility of providing for a system.

The most commonly used system of sewage disposal for the isolated dwelling consists of a settling tank and soil absorption field. In the consideration of this method of sewage disposal, it is assumed that disposal on property adjacent to the dwelling is feasible and will be acceptable to health authorities that have jurisdiction. In the event that disposal by soil absorption is not feasible, and it becomes necessary to discharge the sewage into some drainage course, the proper health authorities should be consulted to ascertain whether this will be permitted, and if so, what requirements as to location, treatment, etc., must be complied with. Obviously, such requirements vary widely in different localities, hence it is impractical to suggest standards to satisfy all the possible situations.

Only domestic sewage and basement drainage should be allowed to enter the house sewer. Storm water from the roof and all surface drainage should be conducted in pipes which are not connected to those that carry domestic sewage, and such storm water should not be allowed to enter the sewage disposal system.[2]

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[1] Supplement No. 124 to the Public Health Reports.

The following general principles governing the location and the design of sewage-disposal systems are suggested for isolated dwellings where a settling tank and soil absorption system is used:

I. HOUSE SEWER

(*a*) *Location.*—(1) The sewer should be located at sufficient depth to protect it from damage caused by external forces such as heavy surface loadings or low temperatures.

(2) The sewer should be kept away from natural obstacles such as trees, shrubs, and basements so as to minimize difficulties caused by clogging with roots or by seepage.

(3) The sewer should be kept at sufficient distance away from, and be so constructed as to protect, adjacent water supplies or water distribution systems from contamination.

(4) The sewer should not penetrate ground-water strata.

(*b*) *Pipe sizes.*—The pipe should be of a size adequate for the purpose and should also be large enough to reduce the possibility of clogging to a minimum.

(*c*) *Material.*—The pipe should be of material which will resist the corrosive action of sewage and soil.

(*d*) *Joints.*—The pipe should be fitted together in such a way as to provide water-tight and root-tight joints.

(*e*) *Construction.*—The pipe lines should be laid straight and with sufficient fall to insure cleansing velocities. The pipe should be accessible at all changes of grade or alignment to facilitate repair or inspection.

II. SETTLING TANK

(*a*) *Location.*—(1) The tank should be a sufficient distance from, and at a lower elevation than, adjacent water-supply systems so as to insure their protection against contamination either underground or over the surface.

(2) The tank should be removed from dwellings a sufficient distance to prevent any possible seepage reaching the basements and to minimize the menace of flies and odors which might arise from the plant.

(3) The site should not be subject to flooding with surface water. It should be accessible so as to facilitate the periodic removal of digested solids and to facilitate inspection.

(*b*) *Capacity.*—(1) The tank should be provided with adequate capacity to obtain efficient removal of settleable solids and also to hold the solids during the digestion period.

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[2] Recommendations concerning plumbing are given in the section of the report that deals with this subject.

(*c*) *Cover.*—The interior of the tank should be accessible for maintenance and inspection purposes.

(*d*) *Dimensions.*—The proportions of depth to width and length of the tank and the construction of the inlet and the outlet structures should be such as to facilitate both the sedimentation and sludge digestion processes.

III. SOIL ABSORPTION SYSTEM

(*a*) *Location.*—(1–3) The same principles apply as for settling tanks.

(4) A soil-absorption system should be used only where the soil, as demonstrated by tests, is favorable and will absorb water readily.

(5) When an absorption field is used, and climatic conditions will permit, the sewage should be distributed at depths where soil bacteria are most active.

(*b*) *Size.*—(1) The size of the system should be based upon absorption tests of the soil, preferably in place.

(*c*) *Construction.*—(1) Provision should be made for.—

(*a*) Circulation of air throughout the distribution system.

(*b*) Equal distribution of the sewage throughout the system.

(*c*) Openings for inspection purposes.

(See appended "Suggested Minimum Standards for the Location and Design of Sewage-Disposal Systems for Isolated Dwellings Where a Settling Tank and Soil Absorption System is Used.")

SCREENING

In localities where mosquitoes and flies are prevalent, all doors and windows and other openings should be screened with No. 16 wire mesh. The entire window or opening should be screened. Screening of the lower half only of a window is unsatisfactory.

Screen doors should always be made to open outward, and should be provided with self-closing devices.

RATPROOFING

Care should be taken to close effectively all openings through foundations and floors, such as openings around pipes and cracked walls. Such openings should be closed with metal sheeting or concrete. Basement windows should be covered with strong, durable screening, such as standard 8-mesh galvanized hardware cloth.

Ventilators and sewer opening should be provided with gratings. Doors should be equipped with self-closing devices.

The building foundation should be of concrete or masonry and should extend from a point at least 2 feet below ground to a point at least 2 feet above ground. In case the floor is closer to the ground than 2 feet, the space in the walls between the studding should be filled with concrete or other suitable material up to a point 2 feet above ground level.

TERMITES

In some sections of the country termites are a serious menace to buildings constructed of wood.

There are four principal ways by which subterranean termites enter buildings: (1) Through direct contact between wood and soil; (2) through cracks in masonry; (3) by means of covered runways or earthlike tubes connecting wood and soil; and (4) by storage of infested wood such as firewood in basements or under porches.

According to independent observers experienced in the control of termites, the most effective method of control has been to exclude termites from buildings by proper construction.

The recommended structural methods of control are as follows: Foundations should be built of impenetrable concrete or masonry; all stumps, chips, and other litter should be removed from beneath the house; adequate ventilation should be provided for the space beneath the house—vents should be screened, the clearance between the ground and woodwork should be at least 6 inches for the outside of the foundation and 18 inches inside, and for the most effective protection, shields of copper or other durable metal should be used to obstruct the passage of termites. For complete protection, termite shields should be continuous and extend entirely through the wall, should project 2 inches or more on either side, and be bent down at an angle of 45°. All posts, piers, pipes, and other structural members in contact with the ground should be shielded with projecting caps or collars. Surfaces that are difficult to inspect should be given the most thorough protection.

Suggested Minimum Standards for the Location and Design of Sewage-Disposal Systems for Isolated Dwellings Where a Settling Tank and Soil Absorption System are Used

I. THE HOUSE SEWER

A. *Location.*—(1) Vitrified clay pipe which carries sewage should not be located nearer than 50 feet, horizontally, to any well, spring, or other source of water supply, or to pumping apparatus, suction pipe, filter, or other features of any water supply. In special cases where it is impossible or not practicable to obtain a 50-foot distance, special construction is necessary to provide additional safeguards. In no case should sewer pipe be nearer than 30 feet to a source of water supply or appurtenances thereto. All sewers that are more than 30 feet away from a water supply and less than 40 feet, horizontally, should be constructed of extra heavy cast-iron pipe with tested, watertight joints. In this zone, joints should be further protected against leakage by a substantial slip-over sleeve extending at least 6 inches from each side of the joint. The annular space between the pipe and the sleeve should be filled with asphalt or material such as sewer-joint compound, or closed with rubber gaskets. All sewers that lie between 40 and 50 feet of the source of water supply or its appurtenances should be constructed of extra heavy cast-iron pipe with tested, watertight joints.

(2) The sewer should not be laid in the same trench with water pipe and should not be nearer than 10 feet, horizontally, to any water pipe. Where necessary,

a sewer may cross a water pipe at an angle and the water pipe should be above the sewer. At the crossing, all that part of the sewer which lies within 10 feet, horizontally, of the water pipe should be constructed of extra heavy cast-iron pipe with watertight joints.

(3) Cast-iron pipe should be used where the earth formations are composed of loose-textured material, fissured rock, and limestone in which interstices form solution channels and provide little filtering action and allow the water to move through it rapidly.

B. *Material.*—The house sewer should be constructed of vitrified clay or extra heavy cast-iron pipe not less than 6 inches in diameter. The pipe should be of the bell-and-spigot type.

C. *Joints.*—The joints of sewer pipe should be constructed of a suitable material, and in such a manner as to insure a watertight joint. Special precautions should be observed to obtain watertight joints in areas where roots of trees or shrubs are likely to reach the sewer trench or where the sewer is laid below ground water level.

D. *Grades.*—The minimum grade for 6-inch pipe should be a 12-inch fall for each 100 feet, horizontally.

E. *Manholes.*—Manholes should be provided at all changes in grade or alinement and should not be more than 300 feet apart in any case.

II. THE SEWAGE-DISPOSAL SYSTEM

A. THE SETTLING TANK

(1) *Location.*—(*a*) The settling tank should be located at least 50 feet from any source of water supply or appurtenances thereto. The tank should be on lower ground where surface drainage will not run toward the water supply.

(*b*) The tank should be so located that it will not be subject to flooding by surface water.

(*c*) The tank should be as far away as practicable from any dwellings, stream, or lake, and in no case should it be nearer than 25 feet to a dwelling or 50 feet to a lake or stream.

(2) Construction.—(*a*) The minimum retention period should be 24 hours, based on the anticipated flow. The estimate of the flow should be based on the plumbing fixtures on the house-drainage system and should not be less than 25 gallons per capita.

(*b*) The capacity of the tank should provide for the retention volume plus 2.5 cubic feet per capita of tributary population for sludge storage. The minimum capacity of the tank should be 500 gallons. In computing the capacity of the settling tank, only that portion shall be included which is located between the vertical planes established by the inlet and outlet baffles or pipes and vertical planes perpendicular to these planes at the point they intersect the outside wall of the tank.

(*c*) Concrete or brick are suitable materials for the settling tank. Concrete slab, sheet-iron doors, or cast-iron manholes are suitable for entrance ways into the tank.

(*d*) The top of the tank should extend to the surface of the ground, and the openings in the top should be sufficient to provide the removal of scum and sludge from all parts of the tank.

(*e*) The floor of the tank should slope toward the entrance end 1 inch per foot.

(*f*) The liquid depth of the tank should be at least 5 feet at the inlet end.

(*g*) The invert of the inlet pipe should be 3 inches above the invert of the outlet pipe.

(*h*) The inlets and the outlets should be baffled. The inlet baffle should be from 12 to 18 inches from the wall, depending on the grade of the influent pipe, and should extend 18 inches below and 6 inches above the flow line. The outlet baffle should be 10 to 12 inches from the wall and should extend 18 inches below and 6 inches above the flow line. For smaller tanks not over 36 inches wide, sanitary tees may be used for inlet and outlet.

(*i*) The inlet should be at least 18 inches below ground surface.

B THE SOIL ABSORPTION SYSTEM

1. The soil absorption system should be located under the same restrictions as apply to the septic tank.

2. Adequate means should be provided through which the sewage will be distributed intermittently throughout the length of the soil-absorption system as follows:

> Dosing tank with capacity equal to 70 percent of tile absorption field and siphon of following size:
>
> Septic tank—
>
> For 5–15 persons, 3-inch siphon.
> For 16 or more persons, 4-inch siphon.
>
> Dosing tanks may be omitted for smaller absorption installations where soil conditions are favorable and where extended periods of freezing weather are not experienced.

3. The absorption system should be laid so as to facilitate the absorption of sewage into the soil, with the following provisions:

For drain tile:

1. Pipe system not less than 4-inch or 6-inch.
2. Joints between pipes, ¼ inch. Openings protected at top.
3. Tile surrounded by broken stone or gravel.
4. Maximum length of lateral, 100 feet.
5. Spacing between laterals not less than 8 feet.
6. Tile should be laid between 12 inches and 24 inches below the surface to obtain maximum benefit from bacteria in the soil. Greater depths may be used where favorable soil absorption conditions exist, using 10 percent additional length of tile.
7. Tile lines converge to inspection manhole at end.
8. Length of tile used based upon percolation test where soil conditions are not entirely favorable.
9. Tile should be laid with uniform grade of 4 inches per 100 feet.

Percolation test.—(1) Dig hole 12 inches square to a depth equal to the proposed tile drainage field. (2) Fill with water and allow to seep away. (3) Fill hole again to depth of 6 inches and observe time required to drop 1 inch.

Time for water to fall 1 inch:	*Rate of dosage per 24 hours per square foot of bottom area of tile trench*
1 minute	4.0 gallons.
2 minutes	3.2 gallons.
5 minutes	2.4 gallons.
10 minutes	1.7 gallons.
30 minutes	0.8 gallons.
60 minutes	0.6 gallons.

The foregoing rates are the maximum and the minimum that are allowable; soils which show a percolation rate of less than 1 inch per hour are unsuitable.

On the basis of the sewage flow of 50 gallons per person per day and a trench 1 foot wide, approximately the following lengths of tile will be required per person in the types of soil indicated:

Clean coarse sand or gravel	12 feet per person.
Fine sand	20 feet per person.
Fine sand with some clay or loam	30 feet per person.
Heavy clay	Unsuitable.

A FURTHER STUDY OF THE PURIFICATION AND TANNIC ACID PRECIPITATION OF SCARLET FEVER TOXIN[1]

By M. V. VELDEE, *Surgeon, United States Public Health Service*

In view of the fact that tannic acid precipitates proteins and most protein decomposition products, this form of precipitation is applicable to the precipitation of scarlet fever toxin only if the toxin is first rendered comparatively free from inert products falling in the above category, or if the toxin is of such high potency that the degree of dilution involved in preparing the individual immunizing doses will compensate for the bulkiness of the precipitate. The most suitable toxin would be one which is both of high potency and low in inert, tannic acid insoluble materials. The present study was undertaken because the methods described in the writer's previous report (*1*) did not entirely meet the above requirements. The report by Rane and Wyman (*2*) has been particularly helpful.

Experience has shown that the broth requirements for the production of toxin involve (*a*) an ample supply of the essential nitrogen containing compounds, the exact identity of which is unknown though experiments show that they are available in peptones and proteoses, (*b*) the presence throughout the growing period of only a trace of dextrose, and (*c*) the maintenance throughout the growing period of the optimum pH range for hemolytic streptococcus growth.

The exact chemical structure of scarlet fever toxin (erythrogenic toxin) is not known. However, certain physical properties are known, namely, that in its present state of purity it contains nitrogen, some of which is present as amino nitrogen, that it is water soluble, not coagulated by heat, heat labile (*3*), soluble in 2 percent acetic acid, insoluble in alcohol, and insoluble in the presence of 50 percent saturation with ammonium sulfate. Therefore in devising a suitable broth medium it is highly desirable to provide the essential nitrogen in a form which is soluble in 50 percent ammonium sulfate. Then the simple step of salting out with 50 percent saturated ammonium sulfate should give a highly purified product.

A wide variety of concentrations and combinations of meat infusion broths containing varying amounts of human serum was prepared and also similar variations in broths made with Difco-peptone and Difco-proteose-peptone, each with the same composite salt solution base. During growth, dextrose was added equally to each culture. Difco-peptone supported good growth, whereas growth developed with more difficulty in a Difco-proteose-peptone broth. At the same time, toxin production seemed to be best in the presence of the proteose-peptone.

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[1] From the Division of Infectious Diseases, National Institute of Health.

A single salting out with 50 percent ammonium sulfate removed 89 percent of the total nitrogen from a toxin grown in 3 percent peptone broth and eliminated 83 percent from a similar peptone-proteose-peptone broth. This step combined with tannic acid precipitation reduced the nitrogen by 91 percent and 87 percent, respectively. Estimating bacterial growth by the total nitrogen contained in the washed bacteria, plain tryptic digest veal broth without the aid of dextrose supported only 0.75 mg of growth, whereas the 3-percent peptone broth with the aid of dextrose supported 7.5 mg of growth, and a broth of the formula given below supported 15.2 mg of growth. Similarly the potencies of the three toxins were approximately of the order 20,000, 300,000 and 500,000 skin test doses per cc. The above figures are based on the use of the NY–5 strain, but trials with strains isolated from six other hemolytic streptococcus infections gave similar results.

Preparation of the broth.—In view of these experimental findings the following culture medium has been adopted (*a*) because of the uniformly high potency of the resulting toxins and (*b*) because of its suitability for the preparation of purified and tannic acid precipitated toxin. At first glance this broth is objectionable because of its high total nitrogen content. Actually, however, because of the high potency of the resulting toxin and the ease with which it lends itself to purification, the total nitrogen per skin test dose, either in the crude toxin, after ammonium sulfate purification, or as the final tannic acid precipitate, is considerably less than in any toxin heretofore released by the commercial laboratories either for the Dick test or for active immunization. For example, lot number HL–50 as a crude toxin contains 433.7 mg of total nitrogen per 100 cc, 72.8 mg after ammonium sulfate precipitation and dialysis, and 57.4 mg after ammonium sulfate and tannic acid precipitation. The potency of this lot is approximately 500,000 STD per cc without concentration.

	Grams per liter
Difco peptone	12.0
Difco proteose-peptone	21.0
Sodium chloride (NaCl)	8.0
Calcium chloride (anhyd. $CaCl_2$)	.27
Magnesium sulfate ($MgSO_4$, $7H_2O$)	.20
Dibasic potassium phosphate (K_2HPO_4, $3H_2O$)	1.5
Monobasic potassium phosphate (KH_2PO_4)	.5
Phenol red	.0075

Distilled water to make 1 liter of finished broth.

Place the water in a suitable container and add all of the ingredients except the phenol red. Heat in streaming steam for 1 hour and then adjust the pH to 7.4. Return to streaming steam for 20 minutes, make up to volume, readjust the pH if necessary, add the phenol red (this may be added advantageously as a 0.25 percent alcoholic solution if small quantities of broth are being prepared), and then filter through paper. Distribute the broth into suitable flasks (2 liters in a 4-liter Erlenmyer flask is convenient). The flask should be provided with a stopper fitted with a bent cotton-stoppered vent tube and a straight open tube through which later ingredients may be added. Cover this tube with an inverted agglutination tube, tie the stopper securely in place, cover the entire top of the flask with a heavy paper cap, and then sterilize in the autoclave for 30 minutes at 15 pounds pressure.

Toxin production.—Prior to culturing, place the flasks of broth at 37° C. for 24 hours as a check on sterility and also in order to warm the broth. Now add 0.25 percent of dextrose through the feed tube (this is added in the form of a 50 percent sterile solution) and then inoculate with an 8- to 12-hour culture of the desired hemolytic streptococcus strain, using at least 5 cc of culture per liter of broth. (An acclimated culture will start growing more promptly. This is obtained by previously culturing in the above-described broth to which has been added 0.02 percent dextrose.) Growth starts slowly so that the reaction does not become acid until after about 12 hours' growth, as indicated by the color change in the phenol red. Because of the deep color of the broth, the first color changes are difficult to read but become easy to read later. Beginning at the end of this initial 12-hour period, add 0.05 percent of dextrose regularly every hour until a total of 1.0 percent has been added, including the 0.25 percent added in the beginning. From this point make the dextrose additions every half hour until the entire amount of dextrose added is 1.5 percent. The dextrose should be thoroughly mixed throughout the culture as soon as added. As frequently as indicated by the color change adjust the pH to approximately 7.2 with the aid of a 15-percent sodium hydroxide solution (at the height of growth this may be necessary as often as every 10 minutes). The alkali must be added slowly through the feed tube with constant agitation of the culture so as to avoid its destructive action on the toxin.

As soon as the color changes cease after the addition of the last portion of the 1.5 percent of dextrose (approximately 1 hour), remove the culture flask from the warm room, filter the toxin free from bacteria, adjust the pH to 7.0, add 0.5 percent of phenol, and finally store at 5° C. for aging before testing for potency and sterility.

Purification of the toxin.—Add to the cold toxin enough ammonium sulfate to give 65 percent saturation (467 grams per liter at 5° C.), agitate until solution is complete, and then place overnight at 5° C. The degree of saturation purposely was raised from 50 percent as a margin of safety, since it does not significantly increase the amount of inert material thrown down. Collect the precipitate by filtering through a thin layer of paper pulp over filter paper in a Buchner funnel. Wash the precipitate with a small amount of 65 percent saturated ammonium sulfate solution and continue the suction until all possible liquid is removed. Return the contents of the funnel to the original flask, so as not to lose the adherent toxin, add the same volume of sterile, phenolized, buffered saline of pH 6.6 (10 percent phosphate buffer, 89.6 percent normal saline, and 0.4 percent phenol) as of crude toxin used, and agitate until solution is complete. Concentration may be accomplished at this point by redissolving in a smaller volume of diluent if desired. Again filter through filter paper in a Buchner funnel and finally through a Berkfeld candle. Store at 5° C. until needed and check for sterility and potency before using.

Precipitation of the purified toxin.—(From this point forward the sterility of the product must be maintained at all times.) Dilute 1,000 cc of the cold toxin with at least an equal volume of the above-described diluent. Dissolve 7.5 grams of tannic acid in 1,500 cc of buffered saline and filter through a Berkfeld. Of this freshly prepared and sterile tannic acid solution take one volume (1,000 cc) and pour it very slowly into the diluted toxin, accompanied by very vigorous rotation of the flask so as to insure prompt mixing. There has now been added 0.5 percent of tannic acid to the original 1,000 cc of toxin. Pour into a graduated cylinder, or other graduated container, and add buffered saline until the total is four volumes (4,000 cc), mix thoroughly, and then place at 5° C. until the precipitate has settled to a volume approximately equal to the original toxin volume and until the supernatant liquid is free from precipitate. Syphon off the supernatant, replace with an equal volume of the same diluent, mix, and allow to stand at 5° C. until the volume of the precipitate is 800 cc or less. Discard the supernatant as before, add 40 cc of a 25-percent sterile solution of acacia (this gives a final 1 percent solution), and make up to the original toxin volume with the same type of buffered saline. Mix thoroughly. The presence of the acacia causes the precipitate to retain its original light, flocculent character. Store at 5° C. and test for sterility before using.

This is the finished purified and tannic acid precipitated scarlet fever parent toxin. Its potency, within titratable limits, is the same as that of the purified soluble toxin or the crude toxin from which it was made. From this parent toxin the individual immunizing doses are prepared by diluting with the same diluent to which has been added 1 percent of acacia in the form of a sterile 25-percent solution.

As stated in the previous report, doses of 750, 3,000, and 10,000 skin test doses with a 2-week interval are tolerated very well by children of grammar-school age or younger. For the protection of pupil nurses, or persons of similar ages, 500, 2,000, 6,000, and 10,000 skin test doses are given. Children may also be given a fourth dose if desired, either repeating the third dose or giving a still larger one.

REFERENCES

(*1*) Veldee, M. V.: Pub. Health Rep., 52: 819 (June 25, 1937).
(*2*) Rane, L., and Wyman, L.: J. Immunol., 32: 321 (April 1937).
(*3*) Green, C. A.: J. Hyg., 35: 93 (February 1935).

NUMBER AND LENGTH OF NURSING VISITS AS INDICES OF NURSING SERVICE[1]

By Helen Bean, *Associate Public Health Nursing Analyst, United States Public Health Service*

Most of the criteria for the evaluation of public health nursing have been stated in terms of volume of service. The number of field nursing visits, the number of patients served in the clinic and office, the number of school inspections, or combinations of these quantitative measures, in their relation to the population or to some other suitable base, are the indices ordinarily used for judging the adequacy of a nursing program. In fact, such measures are so universally employed that a number of standards for an adequate volume of service have been suggested.

The most widely known are those put forth by the Committee on Administrative Practice of the American Public Health Association.[2] The criteria set up by the committee were stated in terms of visits or inspections that should be made under given circumstances. No attempt was made in their standards to take into consideration the number of nurses that would be needed to render the required amount of service. Hiscock[3] used the standards proposed by the committee for urban areas in conjunction with data on the amount of time required to make nursing visits of various types and proposed a standard expressed in terms of the size population one nurse may be expected to serve. Randall,[4] approaching the problem from the standpoint of the nurse, and using empirical determinations of the amount rural nurses have been able to do, has suggested a standard for rural nursing in terms of the volume of work to be expected of a nurse during a period of one year. Although these three recommendations seem to be quite different, the fundamental basis of each is the amount of nursing service rendered.

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[1] From the Division of Public Health Methods, National Institute of Health, in cooperation with the Division of Domestic Quarantine.

[2] Appraisal form for rural health work, second edition, 1932. The American Public Health Association, New York City.

[3] Hiscock, Ira V.: Community health organization. The Commonwealth Fund, New York City, 1932.

[4] Randall, Marian: How much work can a rural public health nurse do? Milbank Memorial Fund Quarterly, vol. XIV, No. 2, p. 107, April 1936.

The employment of these varying quantitative standards has been widespread. The criteria suggested by the committee have been used frequently in the evaluation of the nursing service of health departments, and Hiscock's proposal has often been quoted as a basis for employing more nurses in a given situation. Recently, with certain modifications, the standards of the Committee on Administrative Practice have served as one of the criteria for awarding certificates of merit to health departments that most nearly reached the level of performance laid down in the Appraisal Form.

In spite of the fact that volume of service has been widely used as a measure of public health work, this index has been criticized frequently as giving no indication of the quality of the service. The proponents of the volume measures admit this limitation, but point out that no satisfactory index of quality has been proposed and that there can be no quality unless some service has been rendered.

An index of nursing work seldom used in evaluating nursing programs is the average amount of time spent on a visit. Of course, it is recognized that a long visit does not imply adequate service, but certainly a nurse who habitually spends 10 to 15 minutes on a visit and the intervening travel cannot be rendering the quality of service that characterizes good public health nursing. Therefore, in the lower ranges this index does reflect to some extent the quality of the service.

This paper presents an analysis of the public health nursing work performed for a period of 1 year by the nurses of two counties; first, in terms of volume of service (a strictly quantitative evaluation) and second, in terms of length of time spent per home visit (a more qualitative type of evaluation). A comparison of these two indices for the two counties should reveal some of the limitations of such measures and point out errors of interpretation that may arise from the use of either of the indices alone.

The daily records of the nursing work in two of the counties which were included in the study of rural health department practice by the United States Public Health Service provided the data for the analyses. The counties from which the records were taken were fairly similar in type of population, economic status, and social conditions.[5] County B had an area of 521 square miles and a population of approximately 55,000.[6] County C covered an area of approximately 375 square miles[7] and had a population of approximately 41,000.[7] County C employed five regular nurses during the entire study year; county B added the fifth nurse to its staff during the latter half of the study. Both counties received additional assistance, equivalent to the full time of one nurse, from local nurses engaged from the unemployment rolls. The nurses in county B each had a potential population load of approximately 10,000, while those in county C averaged about 7,000 individuals per nurse. Thus, neither county approximated one nurse per 2,000 population, the standard proposed by Hiscock.

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[5] Mountin, Joseph W.: Effectiveness and economy of county health department practice. Pub. Health Rep., vol. 49, No. 42, October 19, 1934.

[6] Estimated for the study year.

[7] Exclusive of the one county seat which had a separate health administrator. The population is estimated for the study year.

A partial description of the record keeping procedure in these counties has already been presented.[8] Each day the nurse prepared a report showing her activities for that day. Although she made no entry to show the amount of time devoted to each visit, she did record the time spent in the field and the number of visits made during the day. From these data the average amount of time spent in the field per visit was determined.

NURSING ACHIEVEMENTS IN TERMS OF VOLUME OF WORK

The volume of field work which nurses can accomplish will depend in part on the way in which they distribute their time between field services and clinic or office duties. In county C, 67 percent of the nurse's time was spent in home visiting, school health activities, and other field work. The remainder was spent in the office or clinic. In contrast, the nurses in county B spent a smaller proportion of time in the field and devoted more time to clinic and office duties. The percentages for county B for field and for clinic and office duties were 54 and 46, respectively.

Despite the fact that a smaller proportion of the nurses' time in county C was spent in the clinic and office, the volume of clinic service rendered with the aid of the nurses in that county was almost four times the amount given with the nurses' assistance in county B. Furthermore, the nurses in county C made over twice as many home visits and twice as many school examinations as the nurses in county B. In terms of gross volume, the nurses of county C accomplished much more than the nurses of county B. Furthermore, they far exceeded the standards proposed by Randall on the basis of her study of a number of rural health departments (see table 1). In contrast, county B falls considerably below Randall's standards, with the exception of the item "clinic visits."

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[8] Bean, Helen, and Hankla, Emily. Case records as an index of the public health nurse's work. Pub. Health Rep., 52: 1077 (1937). (Reprint No. 1845.)

TABLE 1.—*Average number of home visits, clinic visits, and school examinations and inspections made per nurse per year in 2 counties compared with Randall's standard*[1]

Activities of nurse	County B	County C	Randall's standard
Home visits	1,017	2,126	1,400
Clinic visits	826	3,043	200
School examination and inspection	512	1,193	1,000

[1] Randall, Marian: How much work can a rural public health nurse do? Milbank Memorial Fund Quarterly, vol. 14, No. 2, April 1936.

In the Appraisal Form, standards for nursing work are largely confined to the number of home visits which the nurse makes. No criteria are available for the efforts that nurses devote to making community contacts, organizing lay committees, attending meetings, obtaining volunteer assistance, and many other important community activities. Standards are limited to nursing visits largely because home visiting is the major activity which the nurse carries on alone.[9] When the visits made by the nurses for the various types of service were compared for the two counties, the differences were even more striking than was shown for the total volume. The two most outstanding differences as shown in table 2 were the unusually high number of visits made for communicable disease in county C and the relatively large number of tuberculosis visits made in county B. Of lesser degree were the differences in visits for postpartum service and for infant care. In both of the counties approximately the same number of visits were made for prenatal care and preschool hygiene. Relative to the total amount of service rendered, the visits were more evenly distributed among the different types of services in county B than in county C. In the latter county the major emphasis is on acute communicable diseases.

TABLE 2.—*Number and percentage of nursing visits according to type of service in 2 counties*

Type of service	Nursing visits			
	Number		Percentage	
	County B	County C	County B	County C
All types[1]	5,131	10,551	100.0	100.0
Communicable disease	975	7,356	19.0	69.7
Tuberculosis	1,773	477	34.5	4.5
Prenatal	285	337	5.6	3.2
Postpartum	405	205	7.9	2.0
Infant hygiene	676	1,069	13.2	10.1
Preschool hygiene	1,017	1,107	19.8	10.5

[1] Since there are no standards given in the Appraisal Form for visits to cases of venereal disease, all visits to such cases have been excluded from table 2 and table 3. The number of such visits was 140 for county B and 69 for county C.

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[9] Bean and Hankla, cited in footnote 8.

When the number of visits for each type of service was related to the standards in the Appraisal Form, the relative emphasis on the different activities in the two counties was shifted. The outstanding difference is the excessive proportion of tuberculosis visits made in county B. In terms of the standards, the tuberculosis work in this county was far more intensive than is ordinarily found. It is interesting to note in this connection that the tuberculosis problem in county B was not as great as in county C, if the average number of deaths for the preceding 5 years may be used as an index of the extent of tuberculosis in the two counties. The average annual number of deaths was 21 in county B and 36 in county C. On the other hand, what seemed to be an excessive proportion of communicable disease visiting in county C, as shown in table 2, represented very closely the volume of service specified in the Appraisal Form (see table 3). The large number of visits for communicable disease required by the standard was due to a relatively high incidence of measles in each county. In county B it was the basis for 40 percent of the visits recommended for communicable disease and in county C it accounted for 90 percent of the expected visits for control of contagion. The policies relative to communicable disease visiting varied in the two counties. In county C it was the policy to visit each case of measles, while in county B no routine visits to cases of measles were planned.

TABLE 3.—*Number of nursing visits expected [1] and percentage of visits actually made according to type of service*

Type of service	Number of visits expected [1]		Percentage of visits made of those expected	
	County B	County C	County B	County C
All types	8,603	13,262	59.6	79.6
Communicable disease	[2] 2,480	[2] 7,236	[3] 39.3	[3] 101.7
Tuberculosis	[4] 315	[4] 540	562.9	88.3
Prenatal care	[5] 745	[5] 677	38.3	49.8
Postpartum care	[6] 497	[6] 451	81.5	45.5
Infant hygiene	[7] 1,224	[7] 1,115	55.2	95.9
Preschool hygiene	[8] 3,342	[8] 3,243	30.4	34.1

[1] Using criteria set up in the Appraisal Form for Rural Health Work.

[2] Based on 4 visits per case of typhoid and paratyphoid, 2 visits per case of measles, 2 visits per case of scarlet fever, 2 visits per case of whooping cough, 3 visits per case of diphtheria, 1 visit per case of poliomyelitis, and 1 visit per case of meningococcus meningitis.

[3] Visits to contacts and suspects have been included, but the number of such visits is small.

[4] 15 visits per tuberculosis death.

[5] 15 percent of the total births times 5 visits per case. Since the resident neonatal death rate could not be obtained, the minimum standard was used.

[6] 1 visit for every 2 births.

[7] 1,500 visits per 1,000 live births since average infant mortality rate for past 3 years was 59 in county B and 55 in county C.

[8] 20 percent of preschool population times 3 visits per case.

The nurses in each county rendered the required volume of visits for one type of service only—for tuberculosis in county B and communicable disease in county C. However, those in county C approximated the standard in infant hygiene and tuberculosis, and the nurses in county B performed about 80 percent of the expected postpartum visits and 55 percent of the infant hygiene visits. For the remaining activities, the number of visits made was less than one-half of the standard.

In terms of total volume, the performance in county C was 80 percent of the expected visits, while for county B the performance was only 60 percent of the standard.

In addition to gross volume, the Appraisal Form suggests criteria for evaluating nursing work in terms of the intensity of the service rendered to the individuals reached. The nurses of both counties visited tuberculosis cases more frequently than the standard given in the Appraisal Form required, but for all other cases the visiting was below standard. As judged by frequency of visiting, the service rendered in county C was more intensive than that rendered in county B for all cases other than tuberculosis (see table 4).

TABLE 4.—*Number of visits per case carried as suggested in the Appraisal Form for Rural Health Work and as performed by nurses in 2 counties according to type of case*

Type of case[1]	Number of visits per case carried		
	As suggested in the Appraisal Form	As rendered by nurses in—	
		County B	County C
Tuberculosis	10	17.9	15.4
Prenatal care	5	2.1	3.0
Postpartum care	3	1.2	2.0
Infant hygiene	4	1.5	2.5
Preschool hygiene	3	1.5	2.1

[1] Communicable disease was omitted from this table because of the lack of uniformity in standards among the different diseases.

The foregoing data present a strictly quantitative evaluation of the nursing service rendered in the two counties. Such a measure of the nursing work indicates that county C seemed to receive better service from its nurses than county B. With the one exception of tuberculosis, the nurses of county C rendered more service for each type of case that was included in their program. According to the Appraisal Form for Rural Health Work, county C would be given credit for carrying on a better public health nursing program than county B.

NURSING ACHIEVEMENTS IN TERMS OF LENGTH OF VISIT

When the average amount of time spent by the nurses in making their visits is compared for the two counties, it is found that the nurses from county B exceeded those from county C in the length of their visits. The average time for each visit in county B was 30 minutes, while for county C it was 25 minutes. Although the absolute difference of 5 minutes for each individual visit may appear to be small, it represents a 20-percent increment in the length of the visits.

It should be remembered in this connection that the time given included travel as well as the time spent in actual contact with the patient. The available data do not permit a computation of the time devoted to travel; but since the average mileage between each individual visit in county B was 4.2 miles and in county C was 4.7 miles, it may be safely assumed that the additional length of the visits in county B represents more time spent with the client.

A more detailed analysis of the length of visits in the two counties by months of the study year revealed that, for 9 months of the year, there was little or no difference between the two counties in the amount of time devoted to a visit. For 7 of these 9 months the average length of visits in county C was longer than in county B. The 3 months in which there were exceptions were January, February, and March. During these 3 months the visits in county C were unusually short. Also during these 3 months the nurses of county C made almost half of the total number of visits that are recorded for the entire year. Since it may be safely assumed that excessively short visits cannot be very effective in their instruction of the family, many of the visits in county C were not of the best quality. Nevertheless, in an evaluation based on volume alone, these brief visits are given equal credit with the more extended contacts.

TABLE 5.—*Percentage of the total home visits made each month by the nurses in 2 counties and the length of time spent per visit*

Month	County B		County C	
	Percent of total home visits	Minutes spent per visit	Percent of total home visits	Minutes spent per visit
January	10.6	28	22.2	16
February	4.9	42	14.8	17
March	7.2	34	9.8	21
April	5.9	27	4.4	31
May	10.1	28	5.8	32
June	10.1	29	6.7	36
July	5.8	30	6.0	31
August	7.0	30	3.8	40
September	7.5	27	4.5	33
October	10.7	34	5.6	32
November	9.8	27	7.3	32
December	10.4	27	9.1	23
Mean		30		25

The average amount of time spent on a visit was further analyzed by individual nurse. As shown in table 6, there were wide differences in the length of visits. The variations were more extreme in county C than in county B. In county C nurse *a* spent, on the average, twice as much time for each visit as nurse *e*, the one who made the shortest calls. Although one cannot assume that the visits made by nurse *a* were of better quality than those made by nurse *e*, it is almost certain that not much could be accomplished during a visit of 15 minutes when part of that time was devoted to travel.

TABLE 6.—*Average length of time spent on each home visit by nurse*

Individual nurse	Average number of minutes per visit	
	County B	County C
Nurse *a*	29	30
Nurse *b*	28	27
Nurse *c*	25	22
Nurse *d*	21	18
Nurse *e*	20	15

The evaluation of the nursing work of these two counties made on the basis of the length of the visits showed that the visits in county B tended to be longer than those made by the nurses in county C, thus making it possible for the nurses in county B to render more service than those in county C. In this sense the service in county B was superior to that in the other county. This finding is contradictory to the evaluation based on number of visits irrespective of the time spent in making them.

Such conflicting results from two indices of the nursing work emphasize the need for measures of service that focus on the actual accomplishments rather than on the number of efforts made or on the length of time it took to make them.

SUMMARY

Two measures of activity were applied to the nursing work of two counties fairly similar in area and health problems. One of these measures, a strictly quantitative index, considered only the volume of service. The other, a somewhat more qualitative index, measured the average length of the visit. When applied to the work of the two counties, these two indices produced conflicting results; the county with the better nursing service, as judged by the number and distribution of nursing visits, was shown to have a poorer service if length of visit was used as a basis for evaluation.

The disagreement in the conclusions derived from the application of these two types of measures to the nursing activities of two counties clearly portrays the inadequacy of either index in evaluating a public health nursing program.

Neither measure gives any indication of the results accomplished, such as imparting health information, changing the behavior of those reached, or rendering nursing service to those needing it. Since these are the true objectives of nursing programs, it is suggested that attention be given to developing valid indices of accomplishment rather than continuing the widespread use of quantitative measures, the chief value of which is their objective character.

DEATHS DURING WEEK ENDED MAY 14, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended May 14, 1938	Corresponding week, 1937
Data from 87 large cities of the United States:		
Total deaths	7,973	[1] 8,441
Average for 3 prior years	8,707	
Total deaths, first 19 weeks of year	166,583	186,803
Deaths under 1 year of age	518	[1] 491
Average for 3 prior years	577	
Deaths under 1 year of age, first 19 weeks of year	10,274	11,478
Data from industrial insurance companies:		
Policies in force	68,329,739	69,645,048
Number of death claims	12,494	13,447
Death claims per 1,000 policies in force, annual rate	9.5	10.1
Death claims per 1,000 policies, first 19 weeks of year, annual rate	10.0	11.2

[1] Data for 86 cities.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (-----) indicate that cases or deaths may have occurred although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 21, 1938, and May 22, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended May 21, 1938	Week ended May 22, 1937	Week ended May 21, 1938	Week ended May 22, 1937	Week ended May 21, 1938	Week ended May 22, 1937	Week ended May 21, 1938	Week ended May 22, 1937
New England States:								
Maine	1	0	1	-------	103	21	0	0
New Hampshire	0	0	-------	-------	42	34	0	0
Vermont	0	1	-------	-------	138	1	0	0
Massachusetts	1	6	-------	-------	272	716	1	9
Rhode Island	0	1	-------	-------	1	150	0	1
Connecticut [1]	7	2	3	3	53	189	0	0
Middle Atlantic States:								
New York	26	28	[2] 7	[2] 7	3,351	1,693	8	10
New Jersey	7	16	3	7	845	1,800	2	0
Pennsylvania	29	22	-------	-------	4,597	1,728	5	8
East North Central States:								
Ohio	6	12	-------	24	1,114	586	1	6
Indiana	35	10	5	12	462	653	0	2
Illinois [3]	25	37	16	38	1,319	346	4	4
Michigan [4]	15	18	-------	-------	3,140	168	0	0
Wisconsin	4	1	8	57	2,585	63	1	1
West North Central States:								
Minnesota	1	2	-------	1	370	13	0	2
Iowa	6	6	-------	-------	290	3	1	0
Missouri	19	10	9	36	198	48	0	1
North Dakota	0	0	3	3	96	2	0	2
South Dakota	0	0	-------	-------	-------	5	0	0
Nebraska	1	0	-------	1	234	10	0	3
Kansas	5	7	9	2	407	22	1	1
South Atlantic States:								
Delaware	3	0	-------	-------	14	24	0	0
Maryland [4]	4	6	3	2	55	408	2	1
District of Columbia [3]	3	29	-------	-------	14	107	1	2
Virginia [3]	12	6	-------	-------	413	502	3	5
West Virginia	4	4	24	20	267	78	2	4
North Carolina	11	16	3	3	1,695	272	1	2
South Carolina	2	1	47	69	68	-------	0	0
Georgia [1]	9	8	-------	-------	154	-------	1	1
Florida [1]	1	5	2	3	78	-------	0	1

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 21, 1938, and May 22, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended May 21, 1938	Week ended May 22, 1937	Week ended May 21, 1938	Week ended May 22, 1937	Week ended May 21, 1938	Week ended May 22, 1937	Week ended May 21, 1938	Week ended May 22, 1937
East South Central States:								
Kentucky	6	7	1	8	158	202	9	11
Tennessee [1]	2	4	24	42	113	138	1	2
Alabama [1]	16	5	17	49	304	28	0	8
Mississippi [1] [4]	5	1					1	1
West South Central States:								
Arkansas	5	2	23	26	184	2	0	0
Louisiana	5	10	14	6	37	7	0	1
Oklahoma	3	5	51	34	164	86	1	1
Texas [1]	34	46	176	298	260	1,003	1	5
Mountain States:								
Montana [3]	2	0		21	62	29	0	0
Idaho [3]	0	2	7	15	23	25	0	0
Wyoming	0	0			26	5	0	0
Colorado [3] [5]	6	3			319	20	0	0
New Mexico [3]	1	0	12	1	114	82	1	0
Arizona	4	0	27	25	18	46	0	1
Utah [4]	0	0			317	52	0	0
Pacific States:								
Washington	0	1			28	55	0	1
Oregon [3]	1	3	27	17	58	16	0	1
California	26	32	44	41	978	281	2	4
Total	353	370	566	871	25,538	11,809	50	102
First 20 weeks of year	10,388	9,628	40,899	269,849	638,672	164,931	1,592	3,212

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended May 21, 1938	Week ended May 22, 1937	Week ended May 21, 1938	Week ended May 22, 1937	Week ended May 21, 1938	Week ended May 22, 1937	Week ended May 21, 1938	Week ended May 22, 1937	Week ended May 21, 1938
New England States:									
Maine	0	0	26	21	0	0	0	1	55
New Hampshire	0	0	21	11	0	0	1	0	
Vermont	0	1	8	13	0	0	4	0	73
Massachusetts	0	0	308	259	0	0	1	0	115
Rhode Island	0	0	15	58	0	0	0	1	21
Connecticut [1]	0	0	86	149	0	0	1	0	97
Middle Atlantic States:									
New York	1	1	714	774	0	0	5	8	463
New Jersey	0	1	101	181	0	0	4	1	
Pennsylvania	0	1	665	413	0	0	13	5	254
East North Central States:									
Ohio	0	0	202	209	5	0	5	5	141
Indiana	0	1	76	115	39	19	3	1	21
Illinois [3]	1	1	402	570	17	16	7	5	141
Michigan [4]	2	2	384	790	7	9	2	5	255
Wisconsin	0	0	139	309	3	2	0	0	208
West North Central States:									
Minnesota	0	0	127	137	10	17	0	0	22
Iowa	0	0	96	156	28	20	1	0	34
Missouri	0	0	127	155	24	61	0	3	23
North Dakota	0	0	24	23	14	7	1	1	23
South Dakota	0	0	12	59	11	4	0	0	9
Nebraska	0	0	24	57	9	4	0	0	16
Kansas	0	0	98	210	6	4	0	3	139
South Atlantic States:									
Delaware	0	0	10	8	0	0	0	1	6
Maryland [4]	0	0	78	41	0	0	5	2	62
District of Columbia [3]	0	0	14	14	0	0	0	2	3
Virginia [3]	1	1	17	10	0	0	4	7	117
West Virginia	0	0	35	73	1	2	5	3	32
North Carolina	1	0	17	38	3	0	6	3	345
South Carolina	0	0		1	0	0	2	3	28
Georgia [1]	0	0	16	14	0	0	10	5	91
Florida [1]	3	0	4	4	0	0	3	7	19

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 21, 1938, and May 22, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended May 21, 1938	Week ended May 22, 1937	Week ended May 21, 1938	Week ended May 22, 1937	Week ended May 21, 1938	Week ended May 22, 1937	Week ended May 21, 1938	Week ended May 22, 1937	Week ended May 21, 1938
East South Central States:									
Kentucky	0	0	25	51	1	1	3	5	84
Tennessee [1]	0	1	21	11	3	0	4	7	56
Alabama [1]	1	0	3	5	9	0	2	6	54
Mississippi [1] [4]	0	2	5	4	1	0	9	2	--------
West South Central States:									
Arkansas	0	0	4	11	6	1	5	1	21
Louisiana	2	1	7	11	0	0	7	19	44
Oklahoma	0	0	14	29	14	4	8	4	37
Texas [1]	1	1	74	225	11	16	9	16	364
Mountain States:									
Montana [3]	0	0	11	17	5	19	1	0	29
Idaho [3]	0	0	5	21	10	5	0	3	4
Wyoming	0	0	2	5	0	2	0	0	1
Colorado [3] [5]	0	0	58	30	6	2	1	0	38
New Mexico [3]	0	0	6	16	8	0	3	0	7
Arizona	0	0	7	10	3	0	7	5	50
Utah [4]	0	0	15	16	0	0	0	1	45
Pacific States:									
Washington	0	0	25	42	14	7	1	1	174
Oregon [3]	0	1	22	35	16	7	3	2	23
California	2	2	166	210	70	23	20	2	608
Total	15	17	4,406	5,616	354	252	166	146	4,452
First 20 weeks of year	390	412	113,890	134,892	10,159	6,230	2,540	2,265	85,571

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[1] Typhus fever, week ended May 21, 1938, 28 cases as follows: Connecticut, 1; Georgia, 14; Florida, 3; Tennessee, 1; Alabama, 3; Mississippi, 1; Texas, 5.

[2] New York City only.

[3] Rocky Mountain spotted fever, week ended May 21, 1938, 13 cases as follows: Illinois, 1; District of Columbia, 2; Virginia, 1; Montana, 1; Idaho, 2; Colorado, 3; New Mexico, 1; Oregon, 1.

[4] Period ended earlier than Saturday.

[5] Colorado tick fever, week ended May 21, 1938, Colorado, 1 case.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
April 1938										
Alabama	27	36	268	113	3,668	31	2	38	26	7
Florida	11	58	11	25	2,395	9	1	39	6	20
Georgia	3	28	171	164	2,112	92	5	34	2	23
Illinois	7	124	59	5	13,538	1	3	2,152	132	16
Indiana	6	95	48	--------	5,745	--------	0	597	351	29
Maryland	4	23	34	1	400	3	0	281	0	7
Minnesota	4	13	15	--------	905	--------	0	598	65	5
Mississippi	3	25	2,825	2,408	1,755	406	2	12	8	17
Missouri	7	74	199	28	2,879	--------	2	834	155	18
Nebraska	2	2	27	--------	598	--------	0	152	37	1
New Mexico	0	27	23	--------	374	2	0	52	1	3
New York	30	136	--------	7	16,021	--------	4	3,815	0	18
Ohio	16	60	90	5	9,905	--------	4	1,311	30	24
Oklahoma	4	28	409	59	646	32	4	105	72	13
Pennsylvania	22	155	--------	--------	21,001	1	2	2,220	0	32
Rhode Island	1	0	1	--------	14	--------	0	96	0	0
Vermont	0	7	--------	--------	365	--------	0	54	0	0
West Virginia	22	83	148	2	2,565	1	2	171	1	20

Summary of monthly reports from States—Continued

April 1938	Cases
Anthrax:	
New York	1
West Virginia	1
Chickenpox:	
Alabama	294
Florida	413
Georgia	246
Illinois	1,855
Indiana	311
Maryland	595
Minnesota	596
Mississippi	623
Missouri	263
Nebraska	198
New Mexico	120
New York	3,789
Ohio	2,026
Oklahoma	174
Pennsylvania	3,677
Rhode Island	64
Vermont	114
West Virginia	207
Conjunctivitis:	
Georgia (infectious)	3
New Mexico	2
Oklahoma	1
Dengue:	
Florida	9
Diarrhea:	
Maryland	6
New Mexico	2
Ohio (under 2 years; enteritis included)	19
Dysentery:	
Alabama (amoebic)	1
Florida (amoebic)	3
Georgia (amoebic)	14
Georgia (bacillary)	27
Illinois (amoebic)	10
Illinois (amoebic carriers)	14
Illinois (bacillary)	26
Maryland (bacillary)	6
Minnesota (amoebic)	2
Mississippi (amoebic)	121
Mississippi (bacillary)	725
Missouri (bacillary)	5
New Mexico (amoebic)	3
New Mexico (bacillary)	1
New Mexico (unspecified)	1
New York (amoebic)	9
New York (bacillary)	22
Ohio (bacillary)	1
Oklahoma	1
Pennsylvania (amoebic)	1
Encephalitis, epidemic or lethargic:	
Alabama	3
Florida	3
Illinois	9
Maryland	1
Missouri	1
New York	18
Ohio	1
Oklahoma	1
Pennsylvania	3
West Virginia	2
German measles:	
Alabama	44
Florida	2
Illinois	117
Maryland	31
New Mexico	4
New York	348
Ohio	75
Pennsylvania	262
April 1938—Continued	Cases
Hookworm disease:	
Florida	1,115
Georgia	2,219
Mississippi	432
Impetigo contagiosa:	
Illinois	15
Maryland	10
Oklahoma	1
Lead poisoning:	
Ohio	3
Leprosy:	
Florida	1
Mumps:	
Alabama	200
Florida	222
Georgia	218
Illinois	917
Indiana	131
Maryland	161
Mississippi	290
Missouri	356
Nebraska	111
New Mexico	37
Ohio	841
Oklahoma	29
Pennsylvania	5,346
Rhode Island	5
Vermont	333
West Virginia	57
Ophthalmia neonatorum:	
Illinois	2
Indiana	1
Maryland	1
Mississippi	6
New Mexico	1
New York	8
Ohio	63
Pennsylvania	7
Paratyphoid fever:	
Georgia	5
Illinois	1
New York	6
Ohio	4
Puerperal septicemia:	
Georgia	5
Mississippi	22
New Mexico	2
Ohio	2
Rabies in animals:	
Alabama	79
Florida	9
Illinois	39
Indiana	54
Maryland	2
Minnesota	9
Mississippi	24
Missouri	16
New York [1]	2
Rhode Island	4
Rabies in man:	
Indiana	2
Rocky Mountain spotted fever:	
Illinois	1
Maryland	1
Scabies:	
Maryland	1
Oklahoma	2
Septic sore throat:	
Florida	9
Georgia	70
Illinois	6
Maryland	31
Minnesota	15
Missouri	70
New Mexico	9
New York	148
April 1938—Continued	Cases
Septic sore throat—Contd.	
Ohio	132
Oklahoma	82
Rhode Island	20
West Virginia	5
Tetanus:	
Alabama	7
Florida	3
Georgia	1
Illinois	4
Maryland	1
New York	4
Ohio	3
Trachoma:	
Illinois	39
Indiana	15
Mississippi	10
Missouri	61
Oklahoma	1
Pennsylvania	1
Trichinosis:	
New York	14
Tularaemia:	
Alabama	1
Georgia	10
Illinois	4
Indiana	1
Maryland	2
Minnesota	1
Missouri	2
Oklahoma	6
Pennsylvania	1
Typhus fever:	
Alabama	15
Florida	6
Georgia	24
New York	1
Undulant fever:	
Alabama	3
Florida	5
Georgia	6
Illinois	14
Indiana	11
Maryland	3
Minnesota	4
Mississippi	1
Missouri	7
New Mexico	3
New York	24
Ohio	16
Oklahoma	115
Pennsylvania	8
Vermont	5
Vincent's infection:	
Florida	51
Illinois	14
Maryland	6
New York [1]	105
Oklahoma	4
Whooping cough:	
Alabama	228
Florida	104
Georgia	280
Illinois	463
Indiana	128
Maryland	237
Minnesota	112
Mississippi	1,171
Missouri	202
Nebraska	57
New Mexico	104
New York	1,929
Ohio	700
Oklahoma	483
Pennsylvania	1,054
Rhode Island	76
Vermont	113
West Virginia	323

[1] Exclusive of New York City.

PLAGUE INFECTION IN FLEAS FROM GROUND SQUIRRELS IN BAKER COUNTY, OREG.

Under date of May 17, 1938, Senior Surgeon C. R. Eskey, in charge of plague suppressive measures, San Francisco, Calif., reported that plague infection had been proved, by animal inoculation, in 51 fleas collected May 2, 1938, from 88 *Citellus oregonus* shot 4 to 7 miles northwest of Hereford, Baker County, Oreg.

WEEKLY REPORTS FROM CITIES

City reports for week ended May 14, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	171	126	48	6,745	669	2,294	18	423	27	1,410	--------
Current week [1]	126	49	18	6,679	467	1,596	13	362	38	1,281	--------
Maine:											
Portland	0	1	1	13	2	2	0	0	0	19	23
New Hampshire:											
Concord	0	------	1	0	2	1	0	0	0	0	10
Manchester	0	------	0	0	2	4	0	0	0	0	16
Nashua	0	------	0	0	0	0	0	0	1	0	6
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	1
Burlington	0	------	0	13	0	1	0	0	0	1	8
Rutland	0	------	0	0	0	0	0	0	0	0	3
Massachusetts:											
Boston	0	------	0	192	16	148	0	14	1	16	195
Fall River	0	------	0	0	4	4	0	0	0	7	36
Springfield	0	------	0	26	4	3	0	1	0	10	34
Worcester	0	------	0	1	6	27	0	0	0	18	56
Rhode Island:											
Pawtucket	0	------	0	0	0	1	0	0	0	1	11
Providence	0	------	0	1	9	10	0	0	0	27	70
Connecticut:											
Bridgeport	0	------	0	1	3	16	0	0	1	3	25
Hartford	0	------	0	0	4	22	0	0	0	2	41
New Haven	1	1	0	1	3	0	0	0	0	10	31
New York:											
Buffalo	1	------	0	4	6	42	0	3	0	11	113
New York	32	4	2	2,123	71	326	0	70	4	237	1,392
Rochester	1	1	0	23	3	15	0	2	2	3	69
Syracuse	0	------	0	42	3	7	0	1	0	7	63
New Jersey:											
Camden	2	------	0	15	3	2	0	2	1	0	26
Newark	0	1	0	9	6	7	0	5	0	24	92
Trenton	0	------	0	3	4	4	0	6	0	0	37
Pennsylvania:											
Philadelphia	5	4	1	676	18	94	0	32	3	52	488
Pittsburgh	8	2	2	44	15	42	0	7	0	15	146
Reading	0	------	0	9	1	2	0	1	0	1	25
Scranton	0	------	--------	6	-------	4	0	-------	0	2	--------
Ohio:											
Cincinnati	2	------	0	10	10	6	0	12	0	8	125
Cleveland	2	6	0	249	14	45	0	12	0	57	199
Columbus	0	------	0	36	9	8	0	4	0	11	98
Toledo	0	1	1	106	0	6	1	4	2	11	65
Indiana:											
Anderson	0	------	0	41	2	1	0	0	0	4	12
Fort Wayne	0	------	0	9	3	16	0	0	0	0	25
Indianapolis	0	------	0	177	10	17	0	1	0	0	89
South Bend	0	------	0	63	1	1	0	0	1	2	15
Terre Haute	0	------	0	10	0	4	0	0	0	0	25

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[1] Figures for Tacoma, Washington, estimated; report not received.

City reports for week ended May 14, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Illinois:											
Alton	0	------	0	0	1	3	0	0	0	0	8
Chicago	9	2	2	375	30	205	0	34	6	65	664
Elgin	0	------	0	1	3	8	0	0	0	0	11
Moline	0	------	0	7	1	4	0	1	0	1	10
Springfield	0	------	0	17	2	6	0	0	0	0	15
Michigan:											
Detroit	8	------	2	826	9	137	0	15	0	138	222
Flint	0	------	0	99	7	20	0	1	0	5	19
Grand Rapids	1	------	0	179	2	8	0	0	0	7	28
Wisconsin:											
Kenosha	0	------	0	144	0	3	0	0	0	1	13
Madison	0	------	0	202	2	0	0	1	0	9	26
Milwaukee	0	------	0	51	6	30	0	3	0	66	97
Racine	0	------	0	304	0	3	0	1	0	19	17
Superior	0	------	0	7	0	0	0	0	0	3	10
Minnesota:											
Duluth	0	------	0	13	0	6	0	2	1	3	23
Minneapolis	0	------	0	154	2	14	5	1	1	1	111
St. Paul	1	------	0	0	1	14	0	1	0	2	51
Iowa:											
Cedar Rapids	0	------	--------	4	-------	0	0	-------	0	5	--------
Davenport	0	------	--------	1	-------	4	0	-------	0	0	--------
Des Moines	1	------	0	30	0	24	4	0	0	0	31
Sioux City	1	------	--------	31	-------	8	0	-------	0	4	--------
Waterloo	0	------	--------	0	-------	9	0	-------	0	1	--------
Missouri:											
Kansas City	1	------	0	13	6	16	0	5	0	2	92
St. Joseph	0	------	0	3	1	1	0	0	0	0	18
St. Louis	2	------	2	6	12	51	3	5	0	4	228
North Dakota:											
Fargo	0	------	0	1	0	0	0	1	0	4	5
Grand Forks	0	------	--------	45	-------	1	0	-------	0	0	--------
Minot	0	------	0	2	0	0	3	0	0	1	9
South Dakota:											
Aberdeen	2	------	--------	0	-------	0	0	-------	0	12	--------
Sioux Falls	0	------	0	0	0	0	0	0	0	0	10
Nebraska:											
Lincoln	1	------	--------	21	-------	6	0	-------	0	6	--------
Omaha	0	------	0	156	3	2	0	4	0	0	46
Kansas:											
Lawrence	0	1	0	59	0	0	0	0	0	0	9
Topeka	0	------	1	129	1	0	0	0	0	36	17
Wichita	1	------	0	24	1	4	0	0	0	13	21
Delaware:											
Wilmington	1	------	0	6	5	1	0	1	0	4	36
Maryland:											
Baltimore	4	3	0	36	16	50	0	7	1	43	203
Cumberland	0	------	0	5	2	1	0	1	0	1	18
Frederick	0	------	0	0	0	0	0	0	2	0	6
Dist. of Col.:											
Washington	2	------	0	15	9	18	0	9	1	11	144
Virginia:											
Lynchburg	2	------	0	0	0	3	0	1	0	2	10
Norfolk	0	5	0	0	0	3	0	2	0	2	17
Richmond	1	------	0	105	5	4	0	1	0	0	50
Roanoke	0	------	0	7	2	0	0	1	0	6	12
West Virginia:											
Charleston	0	------	0	3	1	0	0	1	1	0	22
Huntington	1	------	--------	0	-------	7	0	-------	0	0	--------
Wheeling	0	------	0	74	1	2	0	1	0	2	19
North Carolina:											
Gastonia	0	------	--------	31	-------	0	0	-------	0	7	--------
Raleigh	0	------	0	69	6	0	0	1	0	5	19
Wilmington	1	------	0	16	1	0	0	0	0	15	9
Winston-Salem	0	------	0	22	1	1	0	1	0	25	17
South Carolina:											
Charleston	0	4	0	0	1	1	0	2	0	0	20
Florence	0	------	0	3	0	1	0	0	0	0	12
Greenville	0	------	0	18	3	0	0	1	0	4	26
Georgia:											
Atlanta	0	1	0	6	6	3	0	7	0	18	70
Brunswick	0	------	0	19	1	0	0	2	0	0	3
Savannah	0	2	--------	15	1	0	0	0	0	0	22
Florida:											
Miami	1	3	0	2	1	0	0	4	0	2	38
Tampa	2	1	0	36	0	0	0	1	0	0	22

City reports for week ended May 14, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Kentucky:											
Ashland	0	------	0	1	3	1	0	0	0	7	6
Covington	0	1	0	0	3	2	0	2	1	1	16
Lexington	0	------	0	0	1	3	0	2	0	0	20
Louisville	0	------	0	125	3	16	0	3	0	20	65
Tennessee:											
Knoxville	3	------	0	19	2	1	0	2	1	1	34
Memphis	1	------	0	10	6	4	0	2	0	3	75
Nashville	1	------	1	28	3	5	0	3	0	4	43
Alabama:											
Birmingham	1	2	0	19	4	0	0	5	1	1	70
Mobile	1	3	0	2	0	0	0	0	0	0	21
Montgomery	0	------	--------	70	-------	0	0	-------	0	0	--------
Arkansas:											
Fort Smith	0	------	--------	1	-------	0	0	-------	0	0	--------
Little Rock	0	------	0	1	4	0	0	2	0	3	--------
Louisiana:											
Lake Charles	0	------	0	0	1	0	0	1	2	0	6
New Orleans	6	3	2	5	8	8	0	6	0	44	128
Shreveport	0	------	0	4	4	1	0	3	1	0	33
Oklahoma:											
Oklahoma City	0	------	0	2	2	4	0	1	0	1	41
Tulsa	0	------	--------	152	-------	3	0	-------	0	10	--------
Texas:											
Dallas	1	------	0	6	3	5	0	3	1	4	59
Fort Worth	2	------	0	1	2	3	0	5	0	1	40
Galveston	1	------	0	0	1	0	0	1	0	1	10
Houston	4	------	0	1	5	4	1	6	1	0	82
San Antonio	1	------	1	0	7	0	0	7	0	1	67
Montana:											
Billings	0	------	0	2	1	0	0	0	0	3	4
Great Falls	0	------	0	0	0	2	0	0	0	8	7
Helena	0	------	0	2	0	1	0	0	0	2	1
Missoula	0	------	0	0	2	0	0	0	0	0	10
Idaho:											
Boise	0	------	0	0	0	3	2	1	0	0	4
Colorado:											
Colorado Springs	0	------	0	0	3	1	1	0	0	6	8
Denver	12	------	0	62	9	14	0	1	0	11	76
Pueblo	0	------	0	61	3	1	0	1	0	8	11
New Mexico:											
Albuquerque	0	------	0	1	0	2	0	2	0	3	12
Utah:											
Salt Lake City	0	------	0	216	0	5	0	2	1	10	30
Washington:											
Seattle	0	------	0	1	7	5	0	4	1	37	100
Spokane	0	------	0	1	2	3	1	0	0	10	20
Tacoma	-------	------	--------	-------	-------	-------	-------	-------	-------	-------	--------
Oregon:											
Portland	2	------	0	3	6	17	0	1	0	5	76
Salem	0	1	--------	0	-------	3	0	-------	0	0	--------
California:											
Los Angeles	7	6	0	47	0	30	0	14	5	22	287
Sacramento	0	------	0	33	2	1	0	2	0	10	33
San Francisco	0	2	0	6	4	16	0	7	1	41	156

City reports for week ended May 14, 1938—Continued

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Massachusetts:			
Worcester	1	0	0
New York:			
Buffalo	2	0	0
New York	0	1	0
Illinois:			
Chicago	3	1	0
Wisconsin:			
Superior	1	0	0
Missouri:			
St. Louis	0	1	0
Maryland:			
Baltimore	1	1	0
Kentucky:			
Louisville	1	0	0
Tennessee:			
Nashville	1	0	0
Alabama:			
Birmingham	7	0	0
Arkansas:			
Fort Smith	1	0	0
Louisiana:			
New Orleans	1	0	0
Texas:			
Dallas	0	1	0
Colorado:			
Denver	1	0	0
Washington:			
Seattle	0	1	0
California:			
Los Angeles	1	0	0

Encephalitis, epidemic or lethargic.—Cases: New York, 4; Philadelphia, 1; Baltimore, 1.

Pellagra.—Cases: Charleston, S. C., 1; Florence, 1; Atlanta, 3; Savannah, 1; Birmingham, 5; Montgomery, 1; New Orleans, 1; Dallas, 2.

Typhus fever.—Cases: Birmingham, 1; Los Angeles, 1.

FOREIGN AND INSULAR

BERMUDA

Vital statistics—Year 1937.—Following are vital statistics for Bermuda for the year 1937:

Number of live births	762
Number of live births per 1,000 population	23.1
Number of stillbirths	34
Deaths, including stillbirths	363
Deaths, including stillbirths, per 1,000 population	11.08
Deaths under 1 year of age	52
Deaths under 1 year of age per 1,000 live births	71
Deaths from:	
Appendicitis	2
Cancer and other malignant tumors	24
Cerebral hemorrhage, embolism and thrombosis	35
Deaths from—Continued.	
Cirrhosis of the liver	2
Diabetes mellitis	7
Diarrhea and enteritis	9
Homicide	1
Leprosy	1
Malaria	1
Nephritis	24
Pneumonia	8
Septicemia	4
Suicide	1
Syphilis	1
Tuberculosis	10

CANADA

Provinces—Communicable diseases—2 weeks ended April 23, 1938.—During the 2 weeks ended April 23, 1938, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia [1]	New Brunswick [2]	Quebec [3]	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	--------	--------	--------	3	5	1	1	1	--------	11
Chickenpox	--------	6	5	619	365	88	48	18	147	1,296
Diphtheria	--------	6	5	115	7	6	1	------	2	142
Dysentery	--------	--------	--------	1	4	--------	--------	------	--------	5
Erysipelas	--------	--------	--------	28	7	4	3	------	5	47
Influenza	--------	3	--------	6	150	13	1	------	48	221
Lethargic encephalitis	--------	--------	--------	--------	--------	1	--------	------	--------	1
Measles	--------	20	10	574	1,041	14	60	15	72	1,806
Mumps	--------	25	118	--------	164	159	4	14	14	498
Paratyphoid fever	--------	--------	--------	--------	1	--------	--------	------	--------	1
Pneumonia	--------	4	--------	--------	64	--------	7	------	20	95
Poliomyelitis	--------	--------	--------	2	--------	1	--------	------	--------	3
Scarlet fever	--------	44	14	408	201	42	81	42	47	879
Smallpox	--------	--------	--------	--------	--------	--------	--------	2	--------	2
Trachoma	--------	--------	--------	--------	--------	--------	1	------	12	13
Tuberculosis	4	1	26	230	82	5	8	2	52	410
Typhoid fever	--------	2	6	58	7	--------	1	3	3	80
Undulant fever	--------	--------	--------	2	7	--------	--------	------	1	10
Whooping cough	--------	5	--------	254	151	31	1	6	178	626

[1] 2 weeks ended Apr. 27, 1938. [2] 3 weeks ended Apr. 23, 1938. [3] 4 weeks ended Apr. 23, 1938.

CUBA

Habana—Communicable diseases—4 weeks ended May 7, 1938.—During the 4 weeks ended May 7, 1938, certain communicable diseases were reported in Habana, Cuba, as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Diphtheria	13	1	Tuberculosis	9	3
Malaria	[1] 2		Typhoid fever	[1] 24	3
Scarlet fever	2				

[1] Includes imported cases.

Provinces—Notifiable diseases—4 weeks ended April 30, 1938.—During the 4 weeks ended April 30, 1938, cases of certain notifiable diseases were reported in the Provinces of Cuba as follows:

Disease	Pinar del Rio	Habana	Matanzas	Santa Clara	Camaguey	Oriente	Total
Beriberi				3			3
Cancer		1	2	6		2	11
Chickenpox		12	4	64	20	11	111
Diphtheria		23		1	1	3	28
Dysentery (bacillary)		1		1			2
Hookworm disease		1	1				2
Leprosy		1	2	1			4
Lethargic encephalitis		1	1				2
Malaria	18	6	3	51	10	81	169
Measles	1	16	63	3	2	1	86
Poliomyelitis			1		1	2	4
Scarlet fever		2					2
Trachoma			1			35	36
Tuberculosis	23	40	33	47	14	41	198
Typhoid fever	19	58	12	43	7	70	209
Whooping cough				1			1
Yaws						5	5

CZECHOSLOVAKIA

Communicable diseases—February 1938.—During the month of February 1938 certain communicable diseases were reported in Czechoslovakia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	3		Paratyphoid fever	12	1
Cerebrospinal meningitis	40	8	Poliomyelitis	2	
Chickenpox	190		Puerperal fever	31	8
Diphtheria	2,042	120	Scarlet fever	1,603	22
Dysentery	24	1	Trachoma	71	
Influenza	1,094	20	Typhoid fever	420	31
Lethargic encephalitis		2	Typhus fever	2	
Malaria	132				

FINLAND

Communicable diseases—March 1938.—During the month of March 1938, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	248	Poliomyelitis	4
Dysentery	1	Scarlet fever	883
Influenza	11,920	Typhoid fever	42
Paratyphoid fever	19	Undulant fever	2

YUGOSLAVIA

Communicable diseases—4 weeks ended April 24, 1938.—During the 4 weeks ended April 24, 1938, certain communicable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	17	2	Paratyphoid fever	19	8
Cerebrospinal meningitis	103	30	Poliomyelitis	1	
Diphtheria and croup	464	37	Scarlet fever	196	8
Dysentery	20	1	Sepsis	10	8
Erysipelas	170	4	Tetanus	27	10
Favus	6		Typhoid fever	182	25
Leprosy	3		Typhus fever	151	7

Communicable diseases—1936.—During 1936 certain communicable diseases were reported in Yugoslavia as follows:

Disease	Cases	Deaths	Disease	Cases	Deaths
Anthrax	771	79	Paratyphoid fever	373	19
Cerebrospinal meningitis	151	64	Poliomyelitis	110	13
Diphtheria and croup	9, 905	909	Puerperal sepsis	124	48
Dysentery	1, 796	208	Rabies	32	32
Erysipelas	3, 337	136	Scarlet fever	5, 881	114
Kala-azar	11	1	Tetanus	452	207
Leprosy	8	4	Typhoid fever	7, 017	667
Lethargic encephalitis	15	5	Typhus fever	775	50
Measles	10, 235	160			

Population: 15,061,580.

Smallpox.—According to a recent report for the year 1936, issued by the Central Department of Health of Yugoslavia, no case of smallpox had been reported in that country since 1930. The numbers of cases and deaths reported from 1919 to 1930 were as follows:

Year	Cases	Deaths	Year	Cases	Deaths
1919	5, 278	1, 100	1925	14	3
1920	4, 156	941	1926	4	2
1921	2, 119	483	1927	3	0
1922	728	165	1928	0	0
1923	1, 042	198	1929	0	0
1924	330	64	1930	1	0

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for May 27, 1938, pages 880-893. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

China.—Cholera has been reported in China as follows: Shanghai, May 23, 1938, 1 case; Swatow, week ended April 30, 1938, 1 case.

India—Jodhpur.—During the week ended May 14, 1938, 3 cases of cholera were reported in Jodhpur, India.

India (Portuguese)—Noroli.—During the week ended March 26, 1938, 7 cases of cholera were reported in Noroli, Portuguese India.

Indochina (French).—During the week ended May 14, 1938, cholera was reported in Indochina as follows: Annam Province, 85 cases; Tonkin Province, 542 cases; Hanoi, 58 cases.

Plague

Bolivia—Chuquisaca Department—Tomina Province.—For the period April 4–10, 1938, 3 cases of plague were reported in Tomina Province, Department of Chuquisaca, Bolivia.

Peru.—During the month of March 1938, plague has been reported in Peru as follows: Libertad Department, 2 cases; Lima Department, 5 cases, 3 deaths.

United States—Oregon.—A report of plague infection in Oregon appears on page 926 of this issue of PUBLIC HEALTH REPORTS.

Smallpox

Dutch East Indies—Batavia.—During the week ended May 7, 1938, 3 cases of smallpox were reported in Batavia, Dutch East Indies.

Honduras—Tela.—During the week ended May 14, 1938, 1 case of smallpox was reported in Tela, Honduras.

Typhus Fever

Bolivia.—During the period April 4–17, 1938, typhus fever was reported in Bolivia as follows: La Paz Department—La Paz, 1 case, Camacho Province, 6 cases; Oruro, Oruro Department, 2 cases; Potosi, Potosi Department, 3 cases.

China—Shanghai.—During the week ended May 14, 1938, 94 cases of typhus fever were reported in Shanghai, China.

Yellow Fever

Brazil.—Yellow fever has been reported in Brazil as follows: Minas Geraes State, May 1–3, 1938, 2 deaths; Rio de Janeiro State, May 1, 1 death; Santa Catharina State, April 15–18, 1938, 3 deaths.

Colombia—Santander Department—Velez.—On April 19, 1938, 1 death from yellow fever was reported in Velez, Santander Department, Colombia.

Gold Coast—Keta.—During the week ended May 14, 1938, 1 suspected case of yellow fever was reported in Keta, Gold Coast.

Sierra Leone—Kailahun.—On May 9, 1938, 1 suspected case of yellow fever was reported in Kailahun, Sierra Leone.

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UNITED STATES TREASURY DEPARTMENT

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IN THIS ISSUE

Summary of Current Prevalence of Communicable Diseases
Effect of Moisture and Age on Stability of Neoarsphenamine
Effect of Age of Neoarsphenamine on Reaction Expectancy
Flea Infestation of Domestic Rats in San Francisco, Calif.

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UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst Surg Gen. ROBERT OLESEN, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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  Cholera, plague, smallpox, typhus fever, and yellow fever—
    Cholera ... 960
    Plague ... 960
    Smallpox ... 960
    Typhus fever ... 960
    Yellow fever ... 960

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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

April 24–May 21, 1938

The accompanying table summarizes the prevalence of eight important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the Public Health Reports under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ending May 21, the number reported for the corresponding period in 1937, and the median number for the years 1933–37.

DISEASES ABOVE THE MEDIAN PREVALENCE

Smallpox.—The incidence of smallpox remains relatively high. The number of reported cases is about 38 percent greater than the number for the corresponding period in 1937 and more than twice the 5-year median, 1933–37. The situation in the New England and Middle Atlantic States, where no cases were reported, is in striking contrast with other regions of the country.

The incidence of smallpox has been increasing since 1934, when slightly more than 5,000 cases were reported. By 1937, with 11,000 cases the number of reported cases had more than doubled, and preliminary reports for the first 20 weeks of 1938 indicate that the incidence during the current year will be nearly twice that during 1937. With the exception of India and possibly one or two other countries, the United States has one of the highest case rates of smallpox reported in North America and Europe. The actual incidence is unknown in most parts of South America, Africa, and Asia. In view of the success of other leading nations in practically stamping out smallpox, the situation prevailing in the United States reveals a curious indifference to the existence of a disease which can be readily controlled by well-known methods.

Figure 1 shows the geographic distribution of cases of smallpox reported during 1937. The disease is relatively rare in all parts of the country except the Great Plains and Pacific Northwest States. In some of these States, notably Montana and North Dakota, the case rate is among the highest reported anywhere in the world. It should be remembered, however, that some of the countries where smallpox probably prevails to a considerable extent do not report cases of the disease. The present high incidence started in the Northwest States and has slowly spread until many States outside the "smallpox area" are reporting a much higher case rate than usual.

Fortunately the States in the "smallpox area" are sparsely settled. It would indeed be unfortunate if the case rate in Montana, 167 per 100,000 population, prevailed in Pennsylvania or New Jersey, where no cases were reported during 1937. The smallpox problem in this country is concentrated almost entirely within a small number of States, and until it is met by systematic vaccination and revaccination, the United States will continue to have a case rate well above that reported by most of the leading nations of the world.

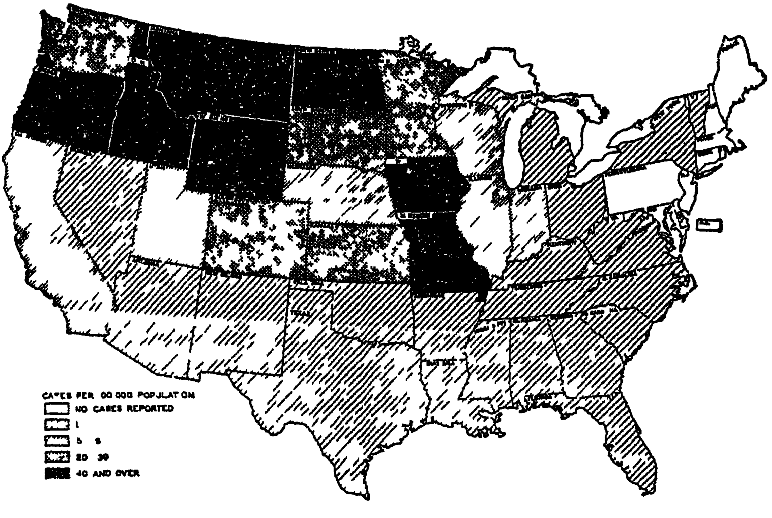

FIGURE 1.—Numbers of reported cases of smallpox per 100,000 population, by States, 1937

Measles.—The incidence of measles continued to decline. For the 4 weeks ending May 21 the reported cases numbered 113,755, approximately 35,000 less than were reported for the preceding 4-week period. The current incidence was, however, more than two times that for the corresponding period in each of the 2 preceding years and was almost twice the 1933–37 median figure (67,856) for this period. In 1935 and 1934 the cases for this period totaled approximately 129,000 and 125,000, respectively.

Each geographic region, except the New England and Pacific, showed a decline from the preceding 4-week period. In both of these regions the incidence was the highest for the season, while in all other regions the peak was reached several weeks earlier. The disease is still unusually prevalent in the East North Central region, where the number of cases (42,412) was more than three times the average incidence, and in the Mountain region, where, although the number of cases (3,412) is not large, it is also more than three times the normal seasonal incidence. The New England and West South Central regions reported fewer cases than is normally expected, but in all other parts of the country the incidence was relatively high.

Typhoid fever.—Typhoid fever was slightly above normal for this season—645 cases as compared with 514 in 1937 and 629 cases, the 1933–37 median incidence for this period. Of the various geographic regions, the East North Central, South Atlantic, and Pacific reported excesses over the preceding 5-year median, while the North Atlantic, West North Central, and East South Central regions reported fewer cases than usually occur at this season. The West South Central region reported about the expected seasonal incidence. An increase of this disease is expected at this time of the year, but the incidence in the East North Central and Mountain and Pacific regions is somewhat above the expectancy.

Number of reported cases of 8 communicable diseases in the United States during the 4-week period Apr. 24–May 21, 1938, the number for the corresponding period in 1937, and the median number of cases reported for the corresponding period 1933–37 [1]

Division	Current period	1937	5-year median	Current period	1937	5-year median	Current period	1937	5-year median	Current period	1937	5-year median
	Diphtheria			Influenza [2]			Measles [3]			Meningococcus meningitis		
United States [1]	1,480	1,511	2,033	2,796	4,939	3,918	113,755	40,148	67,856	232	501	704
New England	49	47	52	21	15	30	2,840	5,101	7,778	7	37	15
Middle Atlantic	301	311	390	52	63	81	35,214	10,646	22,998	41	82	82
East North Central	289	296	347	187	482	585	42,412	9,180	12,191	31	63	89
West North Central	118	102	202	142	251	258	7,304	513	6,672	19	35	35
South Atlantic	208	214	203	570	926	908	12,979	6,126	6,126	47	116	116
East South Central	121	95	117	225	664	384	3,394	2,110	2,110	52	106	51
West South Central	181	271	271	1,194	1,812	933	2,719	4,004	4,004	18	35	25
Mountain	97	39	47	150	229	186	3,412	1,163	1,163	4	11	11
Pacific	119	130	112	255	467	293	3,451	1,206	5,903	11	20	20
	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
United States [1]	64	78	78	18,074	24,611	24,641	1,571	1,112	710	645	514	629
New England	1	3	3	2,082	2,000	1,417	0	0	0	15	12	28
Middle Atlantic	5	5	11	5,371	7,037	7,037	0	0	0	71	54	91
East North Central	14	13	9	5,223	8,683	8,683	365	226	82	105	57	86
West North Central	2	3	4	2,437	3,570	3,064	463	403	268	23	42	38
South Atlantic	10	6	11	767	725	890	12	5	5	154	101	144
East South Central	7	14	4	265	277	277	90	7	7	54	54	82
West South Central	8	17	8	426	810	359	145	61	61	124	128	123
Mountain	3	0	2	409	525	525	150	178	91	41	34	25
Pacific	5	17	17	1,034	1,014	1,080	348	172	172	58	32	36

[1] 48 States. Nevada is excluded and the District of Columbia is counted as a State in these reports.
[2] 11 States and New York City.
[3] 46 States. Mississippi and Georgia are not included.

DISEASES BELOW MEDIAN PREVALENCE

Meningococcus meningitis.—The number of cases of meningococcus meningitis reported for the current period was 233, only about 45 percent of the number reported for the corresponding period in 1937, and also of the 1933–37 median, which is represented by the 1937 figure. The incidence is the lowest since 1934, when the number of cases for this period totaled 220. Each geographic region shared in this favorable situation. In the South Atlantic and East South Central regions, where the disease was unusually prevalent at this time during the 2 preceding years, the incidence has dropped to a more normal seasonal level, and all other regions reported very definite decreases from the average incidence of preceding years.

Scarlet fever.—For the country as a whole the scarlet-fever incidence is relatively low. During the current period, 18,074 cases were reported, as compared with 24,641, 26,142, and 27,821 for the corresponding period in 1937, 1936, and 1935, respectively. In the New England and West South Central regions the incidence is somewhat above the seasonal expectancy, but in the Middle Atlantic and North Central regions, where the disease has been unusually prevalent, the current incidence is considerably below the average for this season of the year.

Diphtheria.—The diphtheria incidence remains comparatively low. For the 4 weeks ending May 21 the number of reported cases was 1,486, as compared with 1,544, 1,649, and 2,044 for the corresponding period in 1937, 1936, and 1935, respectively. The Mountain region reported more than twice the 1933–37 median number of cases for this period, and the East South Central region reported a slight excess over the median. In New England about the average seasonal incidence was reported; in all other regions the incidence was relatively low.

Influenza.—Reported cases of influenza for the current 4-week period totaled 2,796 as against 4,939, 11,783, and 3,358 for the corresponding period in 1937, 1936, and 1935, respectively. The current figure represents the lowest incidence during this period in the 10 years for which these data are available. The West South Central region alone showed an increase over the average seasonal incidence.

Poliomyelitis.—The incidence of poliomyelitis continued below the average for the season; 64 cases were reported for the current 4-week period, as compared with 78 in 1937, which figure also represents the median incidence for the years 1933–37. While the number of cases (19) in the South Atlantic region was not large, it represents the highest incidence during this period in recent years. Some seasonal increase of this disease may be expected within the next month or two.

MORTALITY, ALL CAUSES

The average mortality rate in large cities for the 4 weeks ending May 21, based on data received from the Bureau of the Census, was 11.2 per 1,000 inhabitants (annual basis). The current rate was the lowest for this period since 1933. The average rate for the years 1933–37 was approximately 12.0.

THE EFFECT OF MOISTURE AND AGE ON STABILITY OF NEOARSPHENAMINE

By T. F. Probey, *Associate Pharmacologist*, and W. T. Harrison, *Senior Surgeon, United States Public Health Service*

The instability of the arsphenamines, especially neoarsphenamine, has been recognized since they were first developed. To retard as far as possible deterioration of neoarsphenamine the United States Pharmacopoeia (*1*) makes the following recommendation:

> Preserve neoarsphenamine in sealed tubes of colorless glass, from which the air has been excluded either by the production of a vacuum or by displacement with a non-oxidizing gas, in a cool place, preferably not above 10° C.

From time to time, the National Institute of Health has been requested to reexamine certain lots of the arsphenamines ranging in age up to 15 years from date of manufacture. Although arsphenamine is relatively stable, the Institute would be reluctant to recommend use of any member of the arsphenamine group, however stable, of such unusual age. These instances illustrate that it is possible for the more unstable arsphenamines of this age to be available for clinical use. This suggests the advisability of restudy of the entire question with reference to the adoption of an expiration date.

Because neoarsphenamine is generally considered the least stable of the group, and because it is the most widely used, it was deemed advisable first to concentrate the investigation on this drug rather than attempt a general survey of all the arsphenamines. The percentage of lots of neoarsphenamine which showed evidence of deterioration by the survey was surprisingly high, indicating that a comprehensive study was necessary to determine the time limitation for neoarsphenamine and to ascertain, if possible, the factors which may influence its stability.

These factors may be numerous, especially those of chemical origin, owing to its delicate, indefinite structure; but the physical factors, such as storage, age, temperature, dryness of the powder, and similar conditions, are to a large extent controllable and their effect reducible to a minimum. Protection against deterioration due to exposure to air, improper storage, and temperatures are accounted for by the provision referred to in the United States Pharmacopoeia and generally followed and recommended by all manufacturers. The effect of age of the product and incomplete drying of the powder were considered of principal importance in this investigation.

Roth (*2*), in 1921, recorded that neoarsphenamine was unstable and that deterioration is a general phenomenon which may occur in all products. His experience with material at the Hygienic Laboratory (now National Institute of Health) was that 25 to 30 percent of 2-year old material from two manufacturers had become insoluble. It was also recorded that similar experiences were noted with products of other countries. Van den Branden and Dumont (*3*), in 1933, called attention to the influence of time and temperature upon the stability of neoarsphenamine.

Kolmer (*4*) recorded changes in the powder but was of the opinion that such changes were present in only a few ampules of a lot, found only in 5 to 12 percent of the ampules. He suggested the probability that such deterioration was due to defective handling and ampuling.

The possible influence of "moisture" as a cause of deterioration was noted by Roth (*2*) in one sample of neoarsphenamine consisting of two different shipments, one drier than the other. The drier sample was satisfactory after some 14 months, whereas the other sample was insoluble.

Kolmer (*4*) called attention to humidity at the time of ampuling as a possible factor in causing deterioration of neoarsphenamine.

The loss in weight due to drying of the arsphenamines, especially arsphenamine, was recorded as early as 1911 by Garbel (*5*). Subsequently, considerable work was reported and the nature of the volatile substances was discussed extensively. The loss in weight after drying neoarsphenamine was recorded by Raiziss and Falkov (*6*) as varying from 3.63 to 4.46 percent (4 samples). Myers (*7*) reported that the loss for the other salvarsan substitutes was practically the same as the reported 7.5 percent for salvarsan.

The material tested consisted of samples of neoarsphenamine routinely submitted to the National Institute of Health for official test in compliance with the arsphenamine regulations (*8*), during the 8-year period 1930–37, inclusive, and a few samples of foreign material purchased or obtained by courtesy directly from the manufacturers. There were 1,004 different lot numbers of neoarsphenamine examined.

The products of seven manufacturers holding American license make up the bulk of the material. All lots of several manufacturers were tested, and for each of the others some 20 different lots from each year were picked at random, representing even distribution as to the season of the year of manufacture. The material representing the period 1930–36, inclusive, 1 to 7 years old, consisted of 638 different lot numbers. The 326 lots of the current (1937) material represented practically all lots received for official test.

All material, except the current (1937) samples tested at the time of receipt for official test and recorded as current lots, has been stored in a basement room below ground level on the north side of a stone building. This storage, with temperature slightly lower than 20° C., is considered as being better than average storeroom conditions.

The foreign material was represented by 40 different lot numbers of neoarsphenamine from 13 manufacturers located in 8 countries. Of the 40 lots, 31 may be considered as current material. The remaining 9 lots were old samples from the file of this Institute.

The evidence of stability in this investigation is based entirely upon solubility, i. e., the powder must be completely soluble and the solution clear and transparent (*9*) in a 10-percent solution.

The moisture content is defined as the loss in weight caused by the extraction of volatile substances by drying in vacuo over phosphorus pentoxide for 24 hours, recorded in the percentage which the weight loss bears to the original weight. The identification of the volatile material is of no importance in this study.

The method employed consisted of exposing approximately 0.9 g of neoarsphenamine in a weighing bottle of 25 mm diameter over fresh pentoxide in a vacuum desiccator of 250 mm diameter, at less than 5 mm pressure, for 24 hours at room temperature. The pentoxide was exposed in a 150-mm culture dish and was renewed for each batch of samples. The procedure permitted determinations of not more than 15 samples at one time in a desiccator. This method does not reduce the material to constant weight, as was determined by longer exposure; but in order to keep the test simple and within reasonable time limits, the time of exposure to drying was fixed at 24 hours. Adjustments can be made to obtain constant weight, but the additional time and necessary weighings offer no practical improvement in the test except to obtain the loss computed on dryness to constant weight, which would be slightly higher than figures based on 24 hours of drying.

The moisture content of the 1,004 lots detailed in table 1 varied from less than 0.5 to 14.0 percent; only 4 lots were greater than 7.0 percent, approximately 75 percent (755 lots) were under 3.0 percent, and 43 percent (426 lots) were under 1.0 percent. The distribution of the material according to age, previously described, consisted of 638 lots received during 1930 to 1936, inclusive, detailed in table 2, by age from 1 to 7 years, 326 lots received during current year, and 40 lots of foreign manufacture which, except for a few batches, is of unknown date but believed to be in current clinical use.

TABLE 1.—*Moisture content distribution—1,004 lots of neoarsphenamine*

Moisture content (percent)	Number of lots	Moisture content (percent)	Number of lots
0.0 to 0.5	33	4.5 to 5.0	28
0.5 to 1.0	191	5.0 to 5.5	11
1.0 to 1.5	202	5.5 to 6.0	15
1.5 to 2.0	136	6.0 to 6.5	7
2.0 to 2.5	108	6.5 to 7.0	2
2.5 to 3.0	85	7.0 to 14.0	4
3.0 to 3.5	78		
3.5 to 4.0	57	Total	1,004
4.0 to 4.5	47		

The current (1937) lots received from the manufacturers for official test were examined at the time of their receipt. All of the 326 lots examined were satisfactory. The moisture content varied from less than 0.5 to 6.0 percent, only 8 lots contained more than 3.5 percent, and approximately 64 percent were under 1.5 percent. Inasmuch as these lots are not classifiable by age or instability, they are included only in table 1, giving the total lots tested with moisture distribution.

The moisture content of the 40 lots of foreign manufacture indicated considerable variation in the amount of volatile material present. There was insufficient material, however, for satisfactory comparative appraisal. The age of these lots not being definitely known, they are recorded only in table 1.

In table 2 is detailed the record of the 638 different lot numbers of neoarsphenamine from 7 different licensed manufacturers received during the 7-year period from 1930 to 1936, inclusive. It will be noted that the stability of neoarsphenamine is affected by age and moisture content, deterioration being directly proportional to these influencing factors. As one or both increases, the percentage of instability likewise increases.

The influence of the age of the product, without consideration of the moisture content, is detailed on the bottom line of totals. There it will be seen that the unsatisfactory lots increased from 15 percent (14 of 92 lots) in the 1-year old material to 66 percent (68 of 103 lots) in the material 7 years old. The instability of neoarsphenamine progressively increases as the age increases.

The effect of the moisture content on stability without regard to the age of the drug is shown in the last column—1 to 7 years. The record clearly demonstrates that as the moisture content increases the stability decreases, for example, all of the 12 lots having less than 0.5 percent moisture were stable; but as the moisture increased, the percentage of stable lots decreased to zero at the 5.0 percent moisture level.

The deterioration due to age at a definite moisture level or the effect of moisture for a specific period, can be determined by study of table 2.

TABLE 2.—*The effect of age and moisture on the stability of neoarsphenamine (638 different lots from 7 manufacturers holding American license. Stored at better than average room temperature)*

Moisture content, percent	Age, in years, from official release																	
	7		6		5		4		3		2		1		1 to 7			
	Lots		Lots		Lots		Lots		Lots		Lots		Lots		S (lots)		U	Total
	S	U	S	U	S	U	S	U	S	U	S	U	S	U	Number	Percent	Lots	Lots
0.0 to 0.5	2	0	3	0	------	------	1	0	2	0	3	0	1	0	12	100	0	12
0.5 to 1.0	9	7	8	4	12	2	5	4	13	0	15	0	13	0	75	82	17	92
1.0 to 1.5	0	10	13	7	9	12	7	5	9	2	16	0	23	0	77	68	36	113
1.5 to 2.0	7	4	4	7	7	5	14	4	10	2	13	0	4	1	59	72	23	82
2.0 to 2.5	6	8	6	6	7	5	2	3	4	2	5	0	14	0	44	65	24	68
2.5 to 3.0	10	4	5	7	3	5	1	8	4	5	0	4	4	4	27	42	37	64
3.0 to 3.5	1	9	3	2	0	5	1	10	3	10	3	1	10	5	21	33	42	63
3.5 to 4.0	0	7	1	2	0	3	1	6	0	9	3	12	3	2	8	16	41	49
4.0 to 4.5	0	8	0	4	0	7	0	2	2	5	1	11	4	1	7	16	38	45
4.5 to 5.0	0	2	0	7	0	2	0	4	0	3	1	4	1	1	2	8	23	25
5.0 to 5.5	0	1	0	1	0	6	0	1	------	------	------	------	------	------	0	0	9	9
5.5 to 6.0	0	3	0	6	------	------	0	1	------	------	------	------	1	0	1	9	10	11
6.0 to 7.0	0	5	------	------	------	------	------	------	------	------	------	------	------	------	0	0	5	5
0.0 to 1.5:																		
Number	11	17	24	11	21	14	13	9	24	2	34	0	37	0	164	76	53	217
Percent	39	61	68	32	60	40	59	41	92	8	100	0	100	0	76	----------	24	------
1.5 to 7.0:																		
Number	24	51	19	42	17	38	19	39	23	36	26	32	41	14	109	40	252	421
Percent	32	68	31	69	31	69	33	67	39	61	45	55	75	25	40	----------	60	------
Total	35	68	43	53	38	52	32	48	47	38	60	32	78	14	333	52.2	305	638
Percent	34	66	45	55	42	58	40	60	55	45	65	35	85	15	52.2	----------	47.8	------

S=Stable.
U=Unstable.

The percentage of instability increases in both directions as the influencing factors increase, except that at the 0.5 percent moisture level all products were satisfactory.

It is indicated that instability of neoarsphenamine is common in products after 2 years with a moisture content in excess of 2.5 percent, after 3 years with 2.0 percent moisture content, and that after 4 years only an extremely dry product (less than 0.5 percent moisture) may remain stable.

Analysis of the report of the stability of the products from 1 to 3 years old indicates that there is little difference in the deterioration at the 0 to 1.5 percent as compared with the 0.0 to 2.0 percent moisture level; the former records 98 percent stable as compared with 96 percent of the latter group.

The small number of lots at these two moisture levels in the 3-year age period available for study does not permit a definite appraisal of comparative stability. It is felt, however, that in the interest of safety the lower moisture content should be recommended as being in conformity with the general observation that instability increases with the moisture content.

The adjustments necessary for the manufacturers to produce a product of low moisture content are apparently not difficult to accomplish. The several licensed manufacturers have been appraised of these findings and have proceeded to achieve this objective. The samples received during the current year are approximately equally divided into two groups—the early products before the results of the moisture study were known and the later products during and after adjustment. In the former group, approximately 48 percent were under 1.5 percent moisture content whereas of the latter group 76 percent are in this classification. Recently this percentage has been materially increased and now only the occasional sample is higher than 1.5 percent.

CONCLUSIONS

This investigation indicates that the stability of neoarsphenamine is affected by the age of the product and by the moisture retained in the powder and that instability increases directly as one, or both, of these influences are increased. Neoarsphenamine containing not more than 1.5 percent volatile material as determined by the method herein described may be expected to remain stable for three years when stored at a temperature slightly less than 20° C.

REFERENCES

(1) Neoarsphenamine. U. S. Pharmacopoeia, p. 240.
(2) Roth, G. B.: Keeping qualities of market samples of neoarsphenamine while in ampule. Pub. Health Rep., 36: 2523 (Oct. 14, 1921).
Idem: The deterioration of neoarsphenamine. J. Am. Med. Assoc., 78: 1191 (Apr. 22, 1922).

(*3*) Van den Branden, F., and Dumont, P.: Influence simultanée du temps et de la température sur la conservation des 914 conservés en ampoules. Ann. Soc. belge de med. trop., **13**: 455–471 (Dec. 31, 1933).
(*4*) Kolmer, J. A.: Chemotherapy, p. 629. W. B. Saunders and Co., Philadelphia (1926).
(*5*) Garbel, G. O.: Die quantitative Zusammensetzung des Salvarsans. Apotheker Zeitung, **26**: 215 (Nov. 22, 1911).
(*6*) Raiziss, G. W., and Falkov, M.: Chemistry of neoarsphenamine and its relation to toxicity. J. Biol. Chem., **46**: 209 (March 1921).
(*7*) Myers, C. N.: Development of the chemotherapy of organic arsenicals and the related physical properties. J. Lab. and Clin. Med., **7**: 17 (October 1921).
(*8*) Regulations for the control of the manufacture, importation, and sale of arsphenamine and its derivatives. Mis. Pub. 22, U. S. Pub. Health Service. Govt. Printing Office, Washington, D. C.
(*9*) Preparation and administration of arsphenamine and neoarsphenamine. Pub. Health Rep., **37**: 1867 (Aug. 4, 1922).

THE EFFECT OF THE AGE OF NEOARSPHENAMINE ON REACTION EXPECTANCY

By C. S. STEPHENSON, *Commander, Medical Corps, United States Navy*,[1] T. F. PROBEY, *Associate Pharmacologist*, and W. T. HARRISON, *Senior Surgeon, United States Public Health Service*[2]

In the preceding paper by Probey and Harrison (*1*) the stability of neoarsphenamine is reported to be affected adversely by the age of the material and by incomplete drying of the powder. The percentage of lots showing evidence of deterioration increased as one, or both, of these factors became greater. Although animal toxicity was not investigated, insolubility being the sole criterion of instability, the findings suggested the advisability of ascertaining what effect age of the material might have as a contributing factor in clinical reactions following neoarsphenamine therapy.

Roth (*2*) has reported that changes in the physicochemical character of neoarsphenamine were not necessarily accompanied by an increase in animal toxicity and that an increase in animal toxicity was apparent in material showing no evidence of deterioration. The material used was under 3 years old.

Kolmer (*3*) has noted that cloudy or opalescent solutions of neoarsphenamine are invariably more toxic for the lower animals and man than the perfectly clear solutions.

Probey and Harrison's study (*1*) of the stability of neoarsphenamine included 638 different lots ranging in age from 1 to 7 years. Deterioration was noted in 15 percent of the 1-year old lots; and as the age increased, the percentage increased to 66 percent of the 7-year old material.

Deterioration of neoarsphenamine may be classified as being of two types: one with physicochemical changes, which may be accompanied by increased animal toxicity, and another in which the toxicity has increased without evidence of physical change. The former type, with visible physical evidence of deterioration, offers no problem to the clinician, but the latter, which cannot be detected by examination of the powder or the solution, is of importance, as it may be reflected in the reaction expectancy. Unfortunately, it is extremely difficult to show slight toxic change by the animal test unless very extensive tests are made using a large number of animals; and, moreover, it would be difficult to interpret these findings in terms of human toxicity. The only practical means of determining the actual influence of this type of deterioration is by an extensive clinical study.

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[2] National Institute of Health.

An investigation showing the relation of age of the material as a possible factor in reactions following neoarsphenamine therapy can be accomplished only with the cooperation of an organization with extensive clinical material and the laboratory charged with the official control of the arsphenamines. Since 1924 the medical officers of the United States Navy (*4*) have been required to report all arsenical administrations and to report separately, in detail, each case of unfavorable reaction following arsenical therapy. During the 12-year period 1925–36, administration of 1,087,083 doses of neoarsphenamine have been recorded, with 854 reactions of all types, the incidence being 1 reaction to every 1,272 injections (*4*). The National Institute of Health, charged with the administration of the arsphenamine control, has a record of every lot of the several licensed arsphenamines available for clinical use, including the date that each lot was officially released for distribution. Only this Institute has the information necessary to identify the age of every lot of the arsphenamines in clinical use in the United States.

The clinical reports of the United States Navy of all neoarsphenamine therapy for the 5-year period 1933–37, inclusive, were taken for study. These records were investigated for all essential information and then the age of each lot of neoarsphenamine administered was ascertained from the National Institute of Health. The clinical reports were classified according to the year of administration, and the age of each lot was estimated by the year of official release, i. e. material released in 1935 and administered during 1937 is recorded as having an average age of 2 years.

Since the material is taken entirely from United States Navy records and represents all neoarsphenamine administered by all of its medical services during a continuous period of 5 years, it is assumed that all other factors which might influence the reaction ratio are fairly constant. During this period no essential change has been made in the management of antisyphilitic therapy.

The material included (table 1) comprises all of the neoarsphenamine administered during the 5-year period. The clinical record for

Year of clinical use	Average age, in years, at the time of administration																				
	Current			1 year			2 years			3 years			4 years			5 to 7 years			Total		
	Lots	Doses	Reactions	Lots	Doses	Reactions	Lots	Doses	Reactions	Lots	Doses	Reactions	Lots	Doses	Reactions	Lots	Doses	Reactions	Lots	Doses	Reactions
1937	------	------	------	23	29,768	16	10	9,985	5	22	32,099	17	2	7,177	6	8	2,765	1	65	81,794	45
1936	13	4,514	2	8	11,733	4	22	37,414	26	4	23,440	18	8	13,028	13	7	773	7	62	90,902	70
1935	2	1,242	0	20	22,861	39	6	43,114	27	8	42,410	27	3	4,021	9	3	23	0	42	113,671	102
1934	5	2,279	1	4	21,803	23	11	73,742	79	6	19,130	14	8	727	0	1	118	0	35	117,799	117
1933	3	832	0	10	105,317	68	5	15,890	13	7	9,785	8	5	985	1	2	4,406	2	32	137,215	92
1933-37 (total)	23	8,867	3	65	191,482	150	54	180,145	150	47	126,864	84	26	25,938	29	21	8,085	10	236	541,361	426
Reactions:																					
Mild	------	------	2	------	------	84	------	------	102	------	------	49	------	------	25	------	------	8	------	------	270
Severe	------	------	1	------	------	62	------	------	42	------	------	31	------	------	3	------	------	1	------	------	140
Fatal	------	------	0	------	------	4	------	------	6	------	------	4	------	------	1	------	------	1	------	------	16
Reaction ratio to doses, 1 to—	------	2,956	------	------	1,276	------	------	1,200	------	------	1,510	------	------	894	------	------	808	------	------	1,270	------

Reaction expectancy: Lots current to average age of 3 years: 1 to 1,312 doses.
Lots average age in excess of 3 years: 1 to 870 doses.

each year is detailed separately, showing the age of the material by years with the number of doses administered and the reactions. The totals give the summary for the entire period, showing the number of doses and reactions with the reaction expectancy according to the age of the material.

The total number of administrations was 541,381, representing 326 lots of three different manufacturers. The reactions recorded numbered 426, and were classified according to severity as "Mild," 270; "Severe," 140; and "Deaths," 16. The reaction expectancy is 1 to 1,270 doses, which is in agreement with a previous United States Navy report of 1 to every 1,272 doses (*4*).

The reaction expectancy increases as the age of the material increases, excepting lots with an average age of 3 years, which show a slight decrease. The material with an average age not in excess of 3 years shows a reaction expectancy of 1 to 1,312 doses, as compared with the ratio of 1 in 870 doses in material older than 3 years, an increase of approximately 65 percent.

Analysis of 541,381 human doses of neoarsphenamine from all medical services of the United States Navy over a continuous 5-year period shows that the reaction expectancy increases with the age of the material. This clinical experience agrees with the laboratory observation that neoarsphenamine changes with age.

REFERENCES

(*1*) Probey, T. F., and Harrison, W. T.: The effect of moisture and age on stability of neoarsphenamine. (Preceding article.)

(*2*) Roth, G. B.: Keeping qualities of market samples of neoarsphenamine while in ampule. Pub. Health Rep., **36**: 2523 (Oct. 14, 1921).

(*3*) Kolmer, J. A.: Chemotherapy, p. 629. Wm. B. Saunders Co., Philadelphia (1926).

(*4*) Stephenson, C. S., and Wingo, E. H.: Toxic effects of arsenical compounds as administered in the United States Navy in 1936, with special reference to arsenical dermatitis. U. S. Naval Med. Bull., **35**: 517 (October 1937).

FLEA INFESTATION OF DOMESTIC RATS IN SAN FRANCISCO, CALIF.

By C. R. Eskey, *Senior Surgeon, United States Public Health Service*

During the course of the routine rat-trapping operations carried on at San Francisco during 1936 and 1937, the trappers found in their traps 3,027 live rats, which they killed, placed in cloth bags, and brought to the laboratory for the removal of parasites. Sixty-four percent of the rats thus obtained were found to be flea-infested and yielded a total of 21,659 fleas, or an average of 7 fleas per rat.

Rattus norvegicus was caught in all parts of San Francisco, while the less common *Rattus rattus* was found almost exclusively in the section of the city that was rebuilt after the great fire in 1906. Three quarters of the rats caught were *R. norvegicus* and they averaged nearly twice as many fleas per animal as were collected from *R. rattus*.

Besides the three species of rodent fleas, which will be discussed later, 85 *Ctenocephalides felis* and *canis*, 5 *Pulex irritans*, and 48 *Malaraeus telchinum* were found on domestic rats. The last-named species is one of the common fleas infesting wood rats. No ground squirrel flea was discovered, although some of the rats were caught in areas where there was some contact with ground squirrels. The slight infestation of rats with *Pulex irritans* at the present time is in marked contrast with that existing 30 years ago, when this species was found to average nearly one flea per rat. There has apparently been a great reduction in the prevalence of this bothersome pest in San Francisco.

During most flea surveys a few rats are caught that are infested with enormous numbers of fleas as compared with the number harbored by the general rat population. An exaggerated example of this type of infestation occurred during this investigation when 1,600 *Xenopsylla cheopis* were collected from 10 *R. norvegicus* trapped in the same basement during a 10-day period. Over 400 *cheopis* were found on one of the rats, and one-sixth of the total *cheopis* obtained during the survey were collected from the 10 rats.

It is obvious that, if such abnormal flea infestations as just noted are used for computing the average number of fleas per rat, the results will fail to represent the general prevalence of fleas. For this reason the 1,600 *cheopis* found on the 10 rats caught in the same place have not been included in the computations that follow. For comparative purposes the percentage of flea-infested rats affords more reliable information than is often obtained from indices of infestation.

The following tabulations show the extent to which rats were found infested with the three common rodent fleas:

Xenopsylla cheopis

	Percentage of rats infested	Index
Rats trapped in buildings	34	3.2
Rats trapped exterior to buildings	23	1.4
Total rats trapped	29	2.5

Nosopsyllus fasciatus

Rats trapped in buildings	41	2.7
Rats trapped exterior to buildings	55	3.6
Total rats trapped	47	3.1

Ctenopsyllus segnis

Rats trapped in buildings	25	1.0
Rats trapped exterior to buildings	25	1.0
Total rats trapped	25	1.0

Although the great majority of rats caught out of doors were obtained in traps set very close to buildings, the above figures clearly show that the animals trapped exterior to structures were less infested with *Xenopsylla cheopis* than those caught within buildings, while, conversely, the prevalence of *Nosopsyllus fasciatus* was greater on animals obtained outside of buildings. The fact that rats not associated with buildings may be infested with many *fasciatus* and very few *cheopis* was demonstrated in the case of nearly 300 rats trapped in a large park where they lived in burrows. Seventy-three percent of these park rodents harbored *fasciatus* and only 4 percent *cheopis* with an average of 3.8 and 0.1 fleas respectively per rat.

The prevalence of the three common species of rodent fleas varied according to the species of rats from which they were collected as shown in the following tabulation:

	R. rattus		R. norvegicus	
	Percent infested	Index	Percent infested	Index
X. cheopis	34	2.0	27	2.6
N. fasciatus	11	0.5	59	4.0
C. segnis	15	0.7	28	1.2

During the survey, rats were trapped on 604 different premises, being caught inside buildings on 354 and outside only on 249. In many instances rats were obtained from the same locations during different months while there were a few premises on which rats were caught nearly every month. The following table shows the percentage of premises that were found to be infested with the three species of rat fleas according to whether rats were trapped inside or outside buildings:

	Inside buildings	Outside buildings
	Percent	*Percent*
Premises *X. cheopis* infested	45	20
Premises *N. fasciatus* infested	66	83
Premises *C. segnis* infested	46	59
Premises no fleas found	13	8

The climate of San Francisco may be briefly described as follows: Mean monthly temperatures normally vary from about 50° F. to 61° F. with the coldest weather in January and the warmest in September and October. The average annual precipitation is 22 inches, with most of the rain falling from December to March, inclusive. The relative humidity is high throughout the year, ranging between 80 and 90 percent of saturation during the early morning and dropping to 60 or 70 percent at noon. During the two years that this survey was in progress, climatic conditions did not vary much from normal.

As might be predicted, in a locality with such equitable seasons as those of San Francisco, there was no great seasonal variation in the prevalence of the different species of rodent fleas. At the end of the rainy season, during March and April, there was a definite reduction in the prevalence of *Xenopsylla cheopis*. During these 2 months only about 25 percent of rats were found infested with *cheopis*. These fleas increased in numbers during the following months so that 35 to 40 percent of rats were infested with them from August to October, inclusive. The *cheopis* index fluctuated so erratically from month to month that it was of little value for determining the extent of seasonal infestation. *Nosopsyllus fasciatus* were found on 68 to 72 percent of *R. norvegicus* during the 6 months from February to July, inclusive, while only 55 to 43 percent of Norway rats were infested with *fasciatus* during the other months. There was no definite seasonal variation in the prevalence of *Ctenopsyllus segnis*.

In conclusion it may be stated that the domestic rats of San Francisco act as the natural hosts for three species of rodent fleas, *Xenopsylla cheopis, Nosopsyllus fasciatus*, and *Ctenopsyllus segnis*, and that nearly two-thirds of the rats trapped were flea-infested, or a greater percentage of infestation than has been reported for most communities. The widespread dissemination of fleas on San Francisco rats can be accounted for by the fact that, of the two most prevalent species of fleas found on them, one, *Xenopsylla cheopis*, is particularly adapted to existence on rats having close contact with buildings, while the second, *Nosopsyllus fasciatus*, thrives best on rats nesting exterior to buildings.

DEATHS DURING WEEK ENDED MAY 21, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended May 21, 1938	Corresponding week, 1937
Data from 87 large cities of the United States:		
Total deaths	8,175	[1] 8,311
Average for 3 prior years	8,438	
Total deaths, first 20 weeks of year	174,761	195,141
Deaths under 1 year of age	529	[1] 502
Average for 3 prior years	540	
Deaths under 1 year of age, first 20 weeks of year	10,802	11,981
Data from industrial insurance companies:		
Policies in force	68,326,308	69,731,099
Number of death claims	12,459	13,016
Death claims per 1,000 policies in force, annual rate	9.5	9.7
Death claims per 1,000 policies, first 20 weeks of year, annual rate	9.9	11.2

[1] Data for 86 cities.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables a zero (0) is to be interpreted to mean that no cases or deaths occurred, while leaders (------) indicate that cases or deaths may have occurred, although none were reported.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 28, 1938, and May 29, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended May 28, 1938	Week ended May 29, 1937	Week ended May 25, 1938	Week ended May 29, 1937	Week ended May 28, 1938	Week ended May 29, 1937	Week ended May 28, 1938	Week ended May 29, 1937
New England States:								
Maine	0	0	--------	2	156	10	0	1
New Hampshire	0	0	--------	--------	3	3	0	0
Vermont	0	1	--------	--------	140	7	0	0
Massachusetts	3	7	--------	--------	392	697	0	5
Rhode Island	0	0	--------	--------	--------	59	0	0
Connecticut	7	2	1	--------	71	181	0	0
Middle Atlantic States:								
New York	22	28	[1] 2	[1] 7	3,445	1,565	4	5
New Jersey [2]	10	7	9	1	708	1,291	0	3
Pennsylvania	35	24	--------	--------	2,216	1,909	8	8
East North Central States:								
Ohio	5	31	--------	27	1,302	1,839	4	9
Indiana	5	5	--------	15	150	556	0	3
Illinois	36	36	6	69	1,089	417	0	4
Michigan [2]	1	23	2	--------	3,080	192	1	2
Wisconsin	1	4	22	19	2,511	58	1	0
West North Central States:								
Minnesota	1	1	1	--------	359	10	0	0
Iowa	2	4	--------	1	308	6	0	0
Missouri	7	7	13	25	192	30	0	0
North Dakota	2	1	5	--------	76	--------	0	1
South Dakota	0	1	--------	--------	--------	4	0	0
Nebraska	1	1	1	--------	294	17	0	0
Kansas	2	12	5	--------	401	43	1	3
South Atlantic States:								
Delaware	1	0	--------	--------	8	19	0	0
Maryland [2] [3]	5	7	1	2	84	351	0	4
District of Columbia [3]	11	5	--------	--------	19	146	0	0
Virginia [3]	11	9	--------	--------	325	465	1	11
West Virginia	3	4	28	23	504	35	1	7
North Carolina [3] [4]	6	6	3	3	1,402	298	1	8
South Carolina	9	4	59	101	118	68	1	0
Georgia [4]	1	4	--------	--------	294	--------	0	0
Florida [4]	7	8	3	--------	110	--------	1	2
East South Central States:								
Kentucky	7	5	4	--------	148	293	2	6
Tennessee [4]	5	6	17	16	87	131	2	2
Alabama [4]	7	12	28	10	226	81	6	18
Mississippi [2]	4	2	--------	--------	--------	--------	1	0

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 28, 1938, and May 29, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended May 28, 1938	Week ended May 29, 1937	Week ended May 28, 1938	Week ended May 29, 1937	Week ended May 28, 1938	Week ended May 29, 1937	Week ended May 28, 1938	Week ended May 29, 1937
West South Central States:								
Arkansas	5	3	38	26	143	16	0	0
Louisiana [4]	5	13	5	13	13	10	1	2
Oklahoma	3	10	18	4	95	60	0	1
Texas [4]	25	27	163	137	79	408	1	4
Mountain States:								
Montana [3]	0	2	-------	1	84	1	0	0
Idaho [3]	0	2	8	12	5	14	0	0
Wyoming [3]	0	0	-------	-------	26	5	0	0
Colorado [5]	14	6	-------	-------	266	21	1	2
New Mexico	4	3	3	2	76	75	0	0
Arizona	0	0	40	31	16	41	0	0
Utah [4]	2	0	-------	-------	389	50	0	0
Pacific States:								
Washington	1	3	-------	-------	37	62	0	1
Oregon [3]	7	1	30	9	30	6	2	0
California	22	33	20	52	564	310	7	8
Total	305	370	535	608	22,116	11,900	47	120
First 21 weeks of year	10,693	9,998	41,434	270,457	660,788	176,891	1,639	3,332

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended May 28, 1938	Week ended May 29, 1937	Week ended May 28, 1938	Week ended May 29, 1937	Week ended May 28, 1938	Week ended May 29, 1937	Week ended May 28, 1938	Week ended May 29, 1937	Week ended May 28, 1938
New England States:									
Maine	0	0	31	18	0	0	0	2	68
New Hampshire	0	0	7	7	0	0	0	1	-------
Vermont	0	0	16	22	0	0	0	0	57
Massachusetts	0	0	823	204	0	0	1	0	86
Rhode Island	0	0	16	51	0	0	0	0	14
Connecticut	0	0	98	133	0	0	4	0	143
Middle Atlantic States:									
New York	1	0	643	758	0	0	11	5	452
New Jersey [2]	0	0	97	181	0	0	5	2	177
Pennsylvania	0	1	301	922	0	0	11	7	157
East North Central States:									
Ohio	1	1	241	300	1	1	6	13	212
Indiana	0	0	28	90	22	9	2	1	8
Illinois	1	1	331	607	7	16	4	8	169
Michigan [3]	0	1	381	773	7	0	3	2	295
Wisconsin	0	1	155	289	5	3	2	3	209
West North Central States:									
Minnesota	1	0	79	130	13	23	0	0	31
Iowa	1	0	88	138	31	43	2	1	37
Missouri	0	0	14	120	11	40	2	1	5
North Dakota	0	0	6	32	2	29	0	2	17
South Dakota	0	0	7	27	10	1	0	0	11
Nebraska	0	0	14	47	3	2	0	0	14
Kansas	0	0	84	101	28	18	1	0	148
South Atlantic States:									
Delaware	0	0	6	3	0	0	1	2	9
Maryland [2 3]	0	0	68	38	0	0	3	6	57
District of Columbia [3]	0	0	15	12	0	0	4	0	9
Virginia [3]	0	0	17	4	0	0	2	5	51
West Virginia	0	0	25	55	0	0	5	0	168
North Carolina [3 4]	0	2	10	30	1	0	9	7	315
South Carolina	0	0	4	4	0	0	6	2	62
Georgia [4]	1	0	10	7	0	1	21	1	70
Florida [4]	1	1	2	7	0	0	8	6	33

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended May 28, 1938, and May 29, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended May 28, 1938	Week ended May 29, 1937	Week ended May 28, 1938	Week ended May 29, 1937	Week ended May 28, 1938	Week ended May 29, 1937	Week ended May 28, 1938	Week ended May 29, 1937	Week ended May 28, 1938
East South Central States:									
Kentucky	1	0	12	37	3	0	5	5	87
Tennessee [4]	0	1	7	9	0	0	7	5	59
Alabama [4]	2	1	11	4	0	1	9	4	44
Mississippi [2]	0	5	2	5	4	0	5	10	-------
West South Central States:									
Arkansas	0	0	3	13	9	11	14	2	66
Louisiana [4]	4	0	11	10	1	0	4	15	2
Oklahoma	0	0	14	22	31	1	6	4	21
Texas [4]	2	0	68	120	4	5	8	16	297
Mountain States:									
Montana [3]	0	0	21	21	15	20	0	0	50
Idaho [3]	0	0	4	-------	9	6	1	1	7
Wyoming [3]	0	0	5	13	1	3	0	0	1
Colorado [5]	0	0	45	42	6	5	2	0	28
New Mexico	0	0	10	15	0	2	1	1	19
Arizona	0	0	5	3	3	0	1	1	41
Utah [2]	0	0	20	11	0	0	1	0	60
Pacific States:									
Washington	0	0	17	38	28	4	0	0	183
Oregon [3]	0	0	28	34	4	10	1	3	27
California	2	5	202	191	18	15	4	5	356
Total	18	20	3,692	5,791	277	269	182	149	4,382
First 21 weeks of year	408	432	117,582	140,683	10,436	6,508	2,722	2,414	80,953

[1] New York City only.

[2] Period ended earlier than Saturday.

[3] Rocky M

of Columbia,

[4] Typhus fev

Tennessee, 1; Alabama, 3; Louisiana, 1; Texas, 2.

[5] Colorado tick fever, week ended May 28, 1938, Colorado, 3 cases.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
April 1938										
California	6	126	163	10	3,211	7	3	815	235	30
Hawaii Territory	0	18	16	-------	70	-------	0	4	0	4
Kansas	3	7	39	2	2,784	1	1	509	83	-------
Louisiana	5	31	35	32	59	2	3	33	2	45
Maine	2	9	44	-------	874	-------	0	95	0	5
Montana	0	4	101	-------	116	-------	1	72	29	4
Nevada	1	1	7	-------	22	-------	0	8	0	1
North Dakota	3	1	89	-------	645	-------	0	103	43	2
Oregon	2	13	198	-------	226	-------	-------	255	80	1
Puerto Rico	0	32	133	2,099	20	1	0	1	0	38
South Dakota	2	3	17	-------	6	-------	0	67	68	0
Texas	10	138	1,650	10	1,569	225	5	626	112	73
Virginia	15	49	495	6	2,600	13	2	153	0	12
Washington [1]	1	14	19	-------	103	-------	1	[1] 141	115	3

[1] The number of cases of scarlet fever in Washington for the month of March 1938 should have been given as 208 instead of 228 as shown in PUBLIC HEALTH REPORTS of May 6, 1938, p. 739.

Summary of monthly reports from States—Continued

April 1938

	Cases
Chickenpox:	
California	4,214
Hawaii Territory	100
Kansas	536
Louisiana	45
Maine	274
Montana	154
Nevada	6
North Dakota	137
Oregon	423
Puerto Rico	165
South Dakota	85
Texas	1,228
Virginia	590
Washington	717
Conjunctivitis, epidemic:	
Hawaii Territory	1
South Dakota	23
Washington	1
Dengue:	
Texas	3
Dysentery:	
California (amoebic)	8
California (bacillary)	22
Kansas (bacillary)	1
Louisiana (amoebic)	1
Montana (bacillary)	1
Oregon (amoebic)	1
Puerto Rico	9
Texas (amoebic)	3
Texas (bacillary)	80
Virginia (amoebic)	2
Virginia (bacillary)	48
Encephalitis, epidemic or lethargic:	
California	2
Louisiana	2
Maine	1
Oregon	3
Texas	6
Virginia	2
Washington	1
Filariasis:	
Puerto Rico	3
Food poisoning:	
California	33
German measles:	
California	179
Kansas	13
Maine	30
Montana	6
North Dakota	4
Washington	9
Granuloma, coccidioidal:	
California	10
Hookworm disease:	
California	1
Hawaii Territory	6
Louisiana	23
Impetigo contagiosa:	
Hawaii Territory	11
Montana	3
Oregon	76
South Dakota	1
Jaundice, epidemic:	
California	30
Oregon	11
Leprosy:	
California	2
Hawaii Territory	5
Mumps:	
California	2,630
Hawaii Territory	53
Kansas	853
Louisiana	5
Maine	150
Montana	108
Nevada	82
North Dakota	21
Oregon	96
South Dakota	37
Texas	333
Virginia	403
Washington	882
Ophthalmia neonatorum:	
Louisiana	2
Puerto Rico	3
Paratyphoid fever:	
California	1
Louisiana	1
Maine	2
Texas	2
Virginia	4
Psittacosis:	
California	1
Puerperal septicemia:	
Puerto Rico	3
Washington	2
Rabies in animals:	
California	167
Louisiana	45
Oregon	7
Texas	7
Washington	22
Rabies in man:	
California	1
Virginia	1
Rocky Mountain spotted fever:	
Montana	2
Scabies:	
Montana	1
Oregon	75
Washington	5
Septic sore throat:	
California	19
Kansas	4
Louisiana	15
Maine	1
Montana	9
Septic sore throat—Con.	
Oregon	11
South Dakota	4
Virginia	46
Washington	9
Tetanus:	
California	7
Hawaii Territory	1
Louisiana	2
Puerto Rico	8
Tetanus, infantile:	
Puerto Rico	3
Trachoma:	
California	11
Hawaii Territory	1
Kansas	1
Montana	33
North Dakota	3
Trichinosis:	
California	4
Tularaemia:	
California	2
Kansas	4
Louisiana	10
Texas	9
Typhus fever:	
California	1
Hawaii Territory	3
Louisiana	3
Texas	12
Undulant fever:	
California	15
Kansas	17
Louisiana	5
Maine	3
Oregon	2
Puerto Rico	1
Texas	8
Virginia	5
Washington	4
Vincent's infection:	
Kansas	42
Maine	6
North Dakota	6
Oregon	13
Puerto Rico	1
Washington	2
Whooping cough:	
California	2,333
Hawaii Territory	142
Kansas	658
Louisiana	63
Maine	223
Montana	187
Nevada	5
North Dakota	121
Oregon	100
Puerto Rico	222
South Dakota	78
Texas	1,536
Virginia	428
Washington	687

PLAGUE INFECTION FOUND IN FLEAS FROM GROUND SQUIRRELS IN SANTA CRUZ COUNTY, CALIF.

Under date of May 18, 1938, Dr. W. M. Dickie, Director of Public Health of California, reported plague infection found in fleas collected from *beecheyi* squirrels in Santa Cruz County, Calif., as follows:

> A pool of six lots of fleas from ranches in the vicinity of Watsonville, produced typical plague when inoculated into guinea pigs on April 27.
>
> 17 fleas from 2 *beecheyi* squirrels collected April 27, 8 miles east of Watsonville.
>
> 60 fleas from 1 *beecheyi* squirrel, found dead, 6 miles east of Watsonville.

PLAGUE INFECTION FOUND IN FLEAS AND LICE FROM GROUND SQUIRRELS IN GRANT COUNTY, OREG.

Under date of May 27, 1938, Senior Surgeon C. R. Eskey reported plague infection found in 42 fleas and 2 lice collected from 88 ground squirrels (*Citellus oregonus*) shot May 12 and 13, 6 to 8 miles east of John Day, Grant County, Oreg.

WEEKLY REPORTS FROM CITIES

City reports for week ended May 21, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	165	105	40	6,307	620	2,156	16	418	28	1,304	-------
Current week[1]	112	90	27	6,191	469	1,562	25	393	21	1,308	-------
Maine:											
Portland	0	------	1	10	5	2	0	0	0	12	29
New Hampshire:											
Concord	0	------	0	0	2	0	0	0	0	0	13
Manchester	0	------	0	0	0	3	0	0	0	0	21
Nashua	0	------	0	0	1	0	0	0	1	0	13
Vermont:											
Barre	0	------	0	0	0	0	0	2	0	0	4
Burlington	0	------	0	6	0	2	0	0	3	3	9
Massachusetts:											
Boston	1	------	1	126	18	100	0	5	0	24	218
Fall River	0	------	0	1	4	5	0	2	0	1	41
Springfield	0	------	0	29	3	3	0	2	0	3	29
Worcester	0	------	0	0	7	85	0	0	0	10	55
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	19
Providence	0	------	0	0	7	12	0	1	0	21	62
Connecticut:											
Bridgeport	0	------	1	3	2	8	0	2	0	1	43
Hartford	0	------	0	2	0	20	0	0	0	4	31
New Haven	0	------	0	5	0	1	0	1	1	11	39
New York:											
Buffalo	0	------	0	6	5	35	0	8	0	7	117
New York	25	7	2	1,988	98	322	0	75	2	245	1,445
Rochester	0	------	0	41	2	21	0	1	0	2	73
Syracuse	0	------	0	60	4	6	0	1	0	6	47
New Jersey:											
Camden	4	1	2	15	2	1	0	0	0	11	25
Newark	0	------	0	5	7	16	0	3	0	35	77
Trenton	0	------	0	0	0	9	0	2	0	7	31
Pennsylvania:											
Philadelphia	2	4	2	642	21	104	0	20	2	47	440
Pittsburgh	10	1	0	58	25	25	0	7	4	9	162
Reading	0	------	0	16	3	2	0	2	0	4	33
Scranton	0	------	--------	7	-------	2	0	-------	0	3	--------
Ohio:											
Cincinnati	1	------	1	10	4	8	0	7	0	9	128
Cleveland	2	6	3	252	15	43	0	14	0	61	212
Columbus	0	1	1	24	5	7	0	6	0	3	76
Toledo	1	1	1	79	7	9	0	6	0	15	77
Indiana:											
Anderson	0	------	0	25	1	3	1	0	0	2	10
Fort Wayne	4	------	0	10	3	8	0	1	0	0	26
Indianapolis	1	------	0	190	11	25	2	0	0	6	107
Muncie	0	------	0	2	1	2	9	0	0	0	5
South Bend	0	------	0	48	0	5	0	1	1	0	11
Terre Haute	1	------	0	5	0	8	1	0	0	0	20
Illinois:											
Alton	0	------	0	0	0	4	0	0	0	0	10
Chicago	14	6	1	285	21	205	0	38	2	73	672
Elgin	1	------	1	2	0	2	0	0	0	0	4
Moline	0	------	0	4	1	5	0	0	0	0	12
Springfield	------	------	--------	-------	-------	-------	-------	-------	-------	-------	--------

---

[1] Figures for Springfield, Ill.; Fargo, N. Dak.; and Little Rock, Ark., estimated; reports not received.

City reports for week ended May 21, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Michigan:											
Detroit	3	1	0	349	12	123	0	21	0	132	238
Flint	0	------	0	120	2	32	0	1	0	19	22
Grand Rapids	0	------	0	151	5	10	0	0	0	1	37
Wisconsin:											
Kenosha	0	------	0	81	0	3	0	0	0	4	7
Madison	0	------	0	268	0	10	0	0	0	4	12
Milwaukee	1	------	0	42	10	26	0	4	0	81	104
Racine	0	------	0	224	0	3	0	2	0	11	17
Superior	0	------	0	15	0	3	0	0	0	0	6
Minnesota:											
Duluth	0	------	0	15	2	10	0	0	0	8	19
Minneapolis	1	------	1	284	3	14	5	1	0	3	93
St. Paul	0	------	0	3	8	11	0	1	0	1	63
Iowa:											
Cedar Rapids	0	------	------	10	------	2	2	------	0	2	------
Davenport	0	------	------	1	------	7	0	------	0	0	------
Des Moines	0	------	0	41	0	18	0	0	1	2	29
Sioux City	0	------	------	57	------	5	0	------	0	7	------
Waterloo	0	------	------	22	------	14	0	------	0	0	------
Missouri:											
Kansas City	2	------	0	11	7	21	1	4	0	1	101
St. Joseph	0	------	0	4	0	0	0	1	0	0	23
St. Louis	5	------	0	2	9	45	1	15	0	2	206
North Dakota:											
Fargo	------	------	------	------	------	------	------	------	------	------	------
Grand Forks	0	------	------	37	------	1	0	------	0	0	------
Minot	0	------	0	3	0	0	1	0	0	2	3
South Dakota:											
Aberdeen	0	------	------	1	------	0	0	------	0	4	------
Nebraska:											
Lincoln	0	------	------	24	------	7	0	------	0	4	------
Omaha	0	------	0	165	7	2	0	2	0	0	70
Kansas:											
Lawrence	0	------	0	31	2	0	0	0	0	1	7
Topeka	0	------	0	54	2	0	0	0	0	25	16
Wichita	1	------	0	39	1	3	1	1	0	3	24
Delaware:											
Wilmington	2	------	0	3	2	6	0	0	0	2	28
Maryland:											
Baltimore	3	1	0	26	10	58	0	20	0	54	223
Cumberland	0	------	0	0	0	0	0	0	0	0	9
Frederick	0	------	------	0	------	0	0	------	2	0	------
Dist. of Columbia:											
Washington	3	1	1	14	3	14	0	14	0	3	142
Virginia:											
Lynchburg	0	------	0	2	1	1	0	1	0	4	10
Norfolk	0	1	0	19	1	2	0	3	0	3	29
Richmond	0	------	1	139	4	2	0	2	0	0	55
Roanoke	1	------	0	2	2	1	0	2	0	3	25
West Virginia:											
Charleston	0	------	0	0	0	1	0	1	0	2	6
Huntington	0	------	------	0	------	2	0	------	0	0	------
Wheeling	0	------	0	28	4	0	0	0	1	15	25
North Carolina:											
Gastonia	0	------	------	23	------	0	0	------	0	2	------
Raleigh	0	------	0	38	3	0	0	0	0	2	16
Wilmington	1	------	0	7	0	0	0	1	0	25	15
Winston-Salem	0	------	0	37	0	0	0	0	0	12	16
South Carolina:											
Charleston	1	2	0	1	2	0	0	1	0	0	21
Florence	1	------	0	10	0	0	0	0	0	0	11
Greenville	0	------	0	9	0	0	0	2	0	7	14
Georgia:											
Atlanta	1	5	0	8	8	11	0	6	0	25	116
Brunswick	0	------	0	8	1	0	0	0	0	0	2
Savannah	0	4	0	33	2	0	0	3	1	3	39
Florida:											
Miami	0	1	0	7	4	1	0	2	0	5	28
Tampa	1	2	1	32	2	1	0	1	0	2	28
Kentucky:											
Ashland	0	------	0	3	3	0	0	0	0	5	21
Covington	1	------	0	1	3	0	0	2	0	6	15
Lexington	0	------	0	3	0	1	0	1	0	0	24
Louisville	4	1	1	69	5	10	1	2	0	7	59

City reports for week ended May 21, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Tennessee:											
Knoxville	0	------	0	31	2	1	0	0	1	1	28
Memphis	0	------	0	5	0	5	0	7	0	1	53
Nashville	0	17	0	0	0	6	0	1	0	7	58
Alabama:											
Birmingham	0	4	0	9	6	2	0	6	1	0	73
Mobile	0	1	2	0	4	0	0	1	0	0	25
Montgomery	0	------	------	51	------	0	0	------	0	2	------
Arkansas:											
Fort Smith	0	------	------	4	------	0	0	------	0	0	------
Little Rock	------	------	------	------	------	------	------	------	------	------	------
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	0	4
New Orleans	3	5	2	11	13	3	0	12	2	44	142
Shreveport	0	------	0	8	5	1	0	1	0	0	43
Oklahoma:											
Muskogee	0	------	------	0	------	0	0	------	0	0	------
Oklahoma City	0	------	0	4	3	6	0	1	0	0	42
Tulsa	0	------	------	100	------	1	0	------	0	0	------
Texas:											
Dallas	3	2	2	3	4	11	0	2	1	9	70
Fort Worth	0	------	0	5	2	5	0	1	1	37	31
Galveston	1	------	0	0	1	0	0	2	0	0	12
Houston	1	------	0	1	7	3	3	8	0	2	73
San Antonio	0	1	1	0	0	0	0	5	0	0	47
Montana:											
Billings	0	------	0	0	1	1	0	0	0	3	7
Great Falls	0	------	0	1	3	3	2	0	0	5	13
Helena	0	------	0	1	0	0	0	0	0	0	6
Missoula	0	------	0	0	0	0	0	0	0	0	2
Idaho:											
Boise	0	------	0	0	1	1	2	0	0	1	7
Colorado:											
Colorado Springs	0	------	0	0	1	2	1	1	0	0	8
Denver	3	------	0	57	3	20	0	2	0	5	76
Pueblo	0	------	0	8	1	0	0	0	0	5	3
Utah:											
Salt Lake City	0	------	0	170	3	1	0	5	0	2	35
Washington:											
Seattle	0	------	0	3	4	4	0	2	0	36	97
Spokane	0	------	0	1	3	0	0	0	0	14	29
Tacoma	0	------	0	0	0	4	0	0	0	3	23
Oregon:											
Portland	0	1	0	20	4	7	0	3	0	2	72
Salem	0	------	------	0	------	0	0	------	0	0	------
California:											
Los Angeles	9	10	0	71	18	44	7	24	0	23	334
Sacramento	0	1	1	43	2	0	0	1	0	33	25
San Francisco	1	7	0	6	6	13	0	7	1	53	165

State and city	Meningococcus meningitis		Poliomyelitis cases	State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				District of Columbia:			
Boston	1	0	0	Washington	1	0	0
Worcester	1	1	0	Georgia:			
New York:				Atlanta	1	1	0
Buffalo	2	1	0	Kentucky:			
New York	3	1	1	Louisville	1	0	0
Pennsylvania:				Alabama:			
Philadelphia	1	0	0	Birmingham	0	1	0
Ohio:				Texas:			
Cleveland	1	0	0	Houston	0	0	1
Illinois:				California:			
Chicago	2	1	0	Sacramento	1	1	0
Maryland:							
Baltimore	2	0	0				

Encephalitis, epidemic or lethargic.—Cases: Trenton, 1.

Pellagra.—Cases: Baltimore, 1; Winston-Salem, 2; Atlanta, 1; Savannah, 6; Louisville, 1; Memphis, 1; Birmingham, 5; Montgomery, 1; San Francisco, 1.

Typhus fever.—Cases: New York, 1; Tampa, 1.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—2 weeks ended May 7, 1938.—During the 2 weeks ended May 7, 1938, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada, as follows:

Disease	Prince Edward Island	Nova Scotia[1]	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis					8				1	9
Chickenpox		3	13	297	406	100	76	8	192	1,215
Diphtheria		9	1	65	2	4	7		2	90
Dysentery					1					1
Erysipelas				14	3		2	1	3	23
Influenza		11		7	42	1			29	90
Measles		31	8	373	1,016	4	15	29	42	1,518
Mumps		5			483	188	8	13	21	718
Paratyphoid fever					1					1
Pneumonia		11			72		1		20	104
Poliomyelitis				3	1		1			5
Scarlet fever		34	19	197	200	65	50	47	68	680
Trachoma						1			1	2
Tuberculosis	2	43	40	146	175	23		3	37	469
Typhoid fever		1	1	36	21	3			4	66
Undulant fever					8				1	9
Whooping cough		23		165	174	44	13		79	498

[1] 2 weeks ended May 11, 1938.

JAMAICA

Communicable diseases—4 weeks ended May 14, 1938.—During the 4 weeks ended May 14, 1938, certain communicable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Chickenpox	10	25	Puerperal fever		4
Diphtheria		2	Tuberculosis	36	95
Dysentery	14	3	Typhoid fever	9	63
Leprosy	2	1			

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for May 27, 1938, pages 880-893. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

India—Bombay.—During the week ended May 7, 1938, 1 imported case of cholera was reported in Bombay, India.

Plague

Hawaii Territory—Island of Hawaii—Hamakua District—Paauhau Sector.—A rat found on May 16 and another rat found on May 18, 1938, in Paauhau Sector, Hamakua District, Island of Hawaii, Hawaii Territory, have been proved positive for plague.

United States.—A report of plague-infected fleas in Santa Cruz County, Calif., and plague-infected fleas and lice in Grant County, Oreg., appears on pages 955 and 956 of this issue of PUBLIC HEALTH REPORTS.

Smallpox

Egypt—Alexandria.—During the week ended May 21, 1938, 1 case of smallpox was reported in Alexandria, Egypt.

Typhus Fever

Egypt—Port Said.—During the week ended May 21, 1938, 1 case of typhus fever was reported in Port Said, Egypt.

Yellow Fever

Brazil—Santa Catharina State—Blumenau.—During the period April 19–26, 1938, 4 deaths from yellow fever were reported in Blumenau, Santa Catharina State, Brazil.

Colombia—Santander Department—Contratacion.—On April 6, 1938, 1 death from yellow fever was reported in Contratacion, Santander Department, Colombia.

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UNITED STATES TREASURY DEPARTMENT

PUBLIC HEALTH REPORTS

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Effects of Intramuscular Injections of Vitamin B_1 in Leprosy
The Number of Eggs Produced by the Pinworm, *E. vermicularis*
Prevalence and Fatality of Rocky Mountain Spotted Fever
Typhoid Fever Among Passengers Traced to Contaminated Well

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UNITED STATES PUBLIC HEALTH SERVICE

THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg. Gen. ROBERT OLESEN, *Chief of Division*

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the United States Public Health Service through the Division of Sanitary Reports and Statistics, pursuant to the following authority of law: United States Code, title 42, sections 7, 30, 93; title 44, section 220.

It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

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PUBLIC HEALTH REPORTS

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THE PREVENTION AND CONTROL OF CANCER: A PLAN FOR NATION-WIDE ORGANIZATION*

By J. W. SCHERESCHEWSKY, *Medical Director (Retired), United States Public Health Service*

Without attempting to analyze the various causes which have led to a steady rise in the tide of cancer mortality, the fact remains that the annual increase in the number of deaths caused by cancer constitutes a major problem in public health and preventive medicine.

If we were without time-tried and effective means of opposing this increase, inaction might be excusable. This, however, is far from the case. A substantial reduction in the cancer mortality rate is not only possible, but the means to this end are susceptible of practical application. That the problem of organizing these means and of effectively resisting the increase in cancer mortality is difficult is freely admitted. Yet the rewards to be realized in the conquest of the fear of cancer, in the direct saving of human life, and in the mastery of the most relentless disease in the roster of human ills are so rich as fully to justify a supreme and coordinated effort to this end.

The Bone Act, establishing the National Cancer Institute, with its broad provisions for cooperation with the States, which are implicit in the act, the long-existing cooperative relations which obtain between the United States Public Health Service and the State departments of health, the commencing recognition by States, through legislative act, that the cancer problem is, in fact, a public health problem, all inspire the hope that a Nation-wide official organization to combat this disease should, commensurate with its degree of perfection, produce results, perhaps not so dramatic as has been the case in tuberculosis, but still amply repaying the efforts put forth to that end.

This campaign to be effective should be—

1. Nation-wide in its scope.
2. Constitute a preventive activity of each State department of health.
3. Enlist the cooperation of State medical societies and of State cancer commissions.
4. Bring about the achievement of certain specific ends, known to be effective against cancer, yet robbed of controlling power because of the lack of sufficient application.

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* Presented at the Thirty-sixth Annual Conference of State and Territorial Health Officers with the Public Health Service, Washington, D. C., April 11, 1938.

The steps in the evolution of such an organization are well-defined, and susceptible of development in orderly sequence. They are as follows:

(A) The first requirement is a central organization in the Federal Government to supply leadership, to foster the development of State programs, to furnish training in the diagnosis and treatment of cancer, to undertake research—experimental, clinical, and therapeutic, to disseminate information both popular and scientific, and to evaluate the results of preventive and control measures.

This central organization we already possess in the National Cancer Institute. Implicit in the Bone Act, which created it, is the establishment in that Institute of a Division of State Relations through which it may cooperate with the States in the campaign against cancer. This division should be organized at once in the National Cancer Institute. It may be remarked in passing that among the present personnel of the Public Health Service there are a number of officers who, by virtue of their experience in cooperative activities with State health departments in organizing and promoting other public health projects, have the background, the vision, and the savoir faire to operate effectively in charge of such a division.

(B) The second step to be achieved is the recognition, by States, through legislative enactment, of cancer as a public health problem and to implement the attack on cancer by establishing, in each State department of health, a division of cancer control. Four States have already led the way (Connecticut, Georgia, Massachusetts, and New Hampshire). The other States should follow in the footsteps of these leaders with the least practicable delay.

(C) *Type of State legislation required.*—The fundamental provisions of the Georgia "Cancer Law" form an excellent pattern upon which legislation enacted by other States might well be based. Under this law, among other things, the State department of health is charged with—

(1) Establishing a standard for the organization, equipment, and conduct of cancer units or departments in general hospitals in the State; (2) conducting an educational campaign for cancer control; (3) providing a plan for the care and treatment of indigent persons suffering from cancer; (4) acquiring such laboratories, hospitals, or other property, real or personal, by gift, purchase, or otherwise as is necessary to carry out the provisions of the act.

FUNCTIONS OF A DIVISION OF CANCER CONTROL IN A STATE DEPARTMENT OF HEALTH

The primary functions of a division of cancer control in a State department of health are to organize and to integrate all the forces within State which can operate to reduce cancer mortality; to act, as it were, as an ignition system to explode these forces into concurrent action.

(NOTE.—It may well be suspected that summation of the several factors in the reduction of cancer mortality will operate more forcefully by far in reduction of the cancer mortality rate than the expected effect of each one of them separately considered; e. g., the pasteurization of milk plus purification of public water supplies on the typhoid fever rate.)

So much for a general statement. More specifically the following activities, aimed at effecting a reduction in the State mortality rate from cancer, are both desirable and practicable

COOPERATION WITH THE STATE CANCER COMMISSION

The division of cancer control should maintain close personal relations with the cancer commission of the State medical society, which should act as a consulting and advisory body to the State department of health. The State cancer commission may be expected to lend forceful aid in securing the enactment of legislation by which the State department of health may undertake preventive action against cancer. This has been well illustrated in the State of Georgia, where the State cancer commission and, particularly, its Chairman, Dr. J. L. Campbell of Atlanta, were responsible for initiating and largely for bringing about the enactment of the Georgia "Cancer Law."

COOPERATION WITH THE MEDICAL PROFESSION

In almost no disease is the cooperation of the medical profession in preventive efforts needed to a greater extent than in cancer. Up to the present time, preventive efforts in nearly all the States have been carried out through the cancer commissions of the State medical societies and by individual members of the profession, interested in cancer and impressed by the great preventable loss of life caused by ignorance, procrastination, and ineffective or mistaken therapy.

The cancer control division of the State department of health must necessarily rely upon the medical profession of the State for the early detection of cancer, for persuading the patient to decisive action, for staffing the cancer treatment centers, and for aid in lectures, speeches, and demonstrations in the campaign for popular education in regard to cancer, a necessary feature of the State program.

For these reasons it is incumbent upon the division of cancer control to foster and maintain the closest personal contacts with the medical profession of the State, and to win their approval and support in the efforts of the division in the fight against cancer.

PROMOTION OF EARLY DIAGNOSIS

Here, the objectives to be gained are fourfold:

1. *The education of the general public* as to the early signs and symptoms of cancer. This is attained in the usual way through educational

campaigns, lectures, articles in the daily press, radio broadcasts, and the preparation and distribution of literature. In this connection cooperation with the Women's Field Army of the American Society for the Prevention and Control of Cancer should be sought. If the Women's Field Army of the State has been effectively organized, this should be a powerful educational influence.

2. *The education of the medical profession* as to the technical aspects of early diagnosis, the performance of biopsies, the location of cancer treatment centers. This can be done by addresses before county medical societies, circular letters to the medical profession, and through holding clinics for the instruction of the profession at the various cancer treatment centers in the State.

3. *State diagnostic service.*—The operation of a State service for the microscopic diagnosis of tissues of neoplastic origin only. Other tissues should be refused examination. As this service is intended for the indigent only, the physician submitting the specimen should be required to certify that the patient is unable to pay for a microscopic diagnosis.

This service will be found of great utility to physicians, especially those in rural sections. The Georgia experience shows that physicians find the service of assistance to them in making diagnoses of epitheliomas of the skin and of the buccal cavity, carcinoma of the cervix, rectal cancer, lymphomas and similar growths. The precancerous state of other lesions is also detected and the physician, from the information in the report of examination, is enabled to take steps to avert subsequent carcinomatous transformation of the lesion.

4. *Improvement of existing facilities for the treatment of cancer.*—One of the first activities of a newly established division of cancer control in a State department of health should be that of taking stock of existing facilities for the treatment of cancer. These will be found in two categories: the regularly organized cancer treatment centers and unorganized facilities consisting of individual surgeons, physicians possessing radium, and radiologists owning deep therapy X-ray units. These unorganized facilities will be found scattered at various points throughout the State.

Organized cancer treatment centers.—These centers are usually departments or clinics in general hospitals, avowedly organized for the effective treatment of cancer. When well organized and adequately staffed, such centers wed expert knowledge to enthusiastic cooperation in an effort to carry out the best type of treatment for each kind of malignant neoplasm. They constitute the most effective diagnostic and curative agency at our command against cancer. Such centers make "planned treatment" realizable for the cancer patient. The basic curative force in such centers is the powerful triad found in the cooperation of the surgeon, the pathologist, and the radiologist, reinforced by the other medical services commonly represented on the staffs of general hospitals, such as the ophthalmological, otological, laryngological, gastrological, urological, dermatological, and neurological services. The physical equipment in such centers always includes modern appliances and facilities for surgery, both diagnostic and therapeutic X-ray apparatus, radium, and a clinical laboratory with facilities for carrying out pathological diagnosis and clinical laboratory procedures.

Unorganized facilities.—These will be found to consist usually of individual surgeons especially interested in the surgical treatment of cancer but who are not members of the staff of a regularly organized cancer treatment center; of physicians owning certain amounts of radium; of radiologists who have added deep therapy X-ray units to their diagnostic X-ray equipment.

Once the existing facilities for the treatment of cancer have been surveyed and evaluated, consideration should next be given to the location and distribution of these facilities with respect to the population they are expected to serve. Generally speaking, in a State with average density of population, a cancer treatment center effectively serves a territory represented by a circle of 50-mile radius. In other words, it appears desirable that no cancer patient need travel more than 50 miles to reach a center where he may be effectively treated.

This somewhat arbitrary criterion which, however, seems to work well in practice, is of value in determining, from a geographical standpoint, desirable locations for additional cancer treatment centers.

Organization of additional centers.—Whenever a survey of existing facilities for cancer treatment indicates desirable locations for additional centers, the division of cancer control should make every effort to foster the development of such centers. This is done by making contacts with leading physicians of the community, with local medical societies, with chambers of commerce, civic organizations, women's clubs and auxilliaries, and the daily press. Attempts should be made to raise locally the funds for some needed piece of equipment, such as a deep therapy unit. A prerequisite to establishing additional cancer treatment centers is the presence in the community under consideration of a well-equipped and well-staffed general hospital. Generally speaking, no attempts should be made to establish cancer treatment centers in localities where this fundamental facility is lacking. Radium needs for the center could be supplied by making due application to the Surgeon General of the Public Health Service, through the State health officer for an allocation of radium under the Bone Act.

STATE AID TO INDIGENT SUFFERERS FROM CANCER

One of the most beneficent functions of a division of cancer control is furnishing State aid to indigent sufferers from cancer. Provision for this assistance should be included in every State "cancer law." The total number of cancer patients present at any one time in a State may be estimated at approximately three times the number of annual deaths from cancer. It is also reasonable to assume that one-half of the total number of cancer cases will require aid in financing their treatment. Contact with these indigent patients is best secured by having the family physician apply to the division of cancer control for State aid on behalf of the patient. Some independent agency, such as a local director of relief, or of a county department of welfare, or analogous official, should certify to the patient's inability to pay for treatment. Complete destitution should not be held to be a prerequisite to certification. If this be insisted on, too many victims of cancer, otherwise unable to finance their treatment, would be deemed ineligible for State aid. A convenient standard to apply in determining eligibility for aid is consideration of the question as to whether the financing of treatment would deprive the patient and his family of the necessities of life. State aid to indigent cancer patients should be furnished only at organized cancer treatment centers approved by the State. Attempts should be made to have the county or the township of origin pay a proportionate share of the treatment costs.

REIMBURSEMENT OF CLINICS

Clinics to which patients are sent for treatment are reimbursed the necessary costs on a predetermined scale for each element entering into the treatment. These elements may conveniently be segregated under each of the following heads: Diagnostic; Surgical; Radiation; Hospital care.

Where hospitalization is required as a feature of the treatment, this cost is included in the aid rendered. When treatment is ambulatory, friends or relatives should be expected to care for the patient's shelter at the point of treatment. Friends or relatives may also, as a rule, be depended upon to transport the patient to the treatment center. Where patients are so completely friendless and destitute as to be unable to meet the slight responsibility of shelter, arrangements can be made to board ambulatory patients, while receiving treatment, in the vicinity of the treatment center at rates much lower than the usual per diem hospital rate.

CARE OF TERMINAL CASES

Provision for the institutional care of the terminal cancer case, which, from the humanitarian standpoint, must also be envisaged, should be considered separately and apart from measures for cancer control, in which this phase of the cancer problem does not participate. So far as the control of cancer mortality is concerned, the realistic principle must be adopted (if headway against cancer mortality is to be made) of not granting state aid unless there is a reasonable prospect of arresting the disease. Failure to recognize this principle results in the fruitless expenditure in caring for terminal cases of the funds budgeted for State aid, thus depriving curable cases of their chance for life and health.

WHAT MAY BE EXPECTED FROM CONTROL MEASURES

Existing data as to possible reduction in the cancer mortality rate from control measures of the kind just described are too scanty as yet for evaluation. It has been alleged by enthusiasts that a 50 percent reduction in the cancer mortality rate is practicable. It is felt that such an extensive reduction in the death rate is too much to expect, particularly as we are still without an adequate defense against gastric carcinoma, the most frequent and most commonly fatal form (with the exception, perhaps, of malignant melanoma, which, fortunately, is uncommon) of malignant neoplasm. Pulmonary carcinoma, too, must be regarded as a form of cancer for which treatment is unsatisfactory and which appears to be increasing. Considerable improvement both in timely diagnosis and in therapy is needed before the mortality rate from these types of neoplasm can be significantly reduced. Apart from these exceptions it is reasonable to believe that a thoroughgoing and Nation-wide application of the control measures previously outlined would result finally in a reduction of from 25 to 30 percent in the cancer mortality. For the registration area of the United States, reduction of this order would represent an annual saving of about 35,000 to 37,000 lives. Since this number is about equal to the annual number of victims of fatal automobile accidents this surely would be an effect well worth the achieving upon the Nation's cancer mortality rate, which has never remained stationary but has maintained its inexorable advance every year since the registration area for deaths was established in the United States in 1900.

PROBABLE COSTS

Reckoning on a Nation-wide scale it is likely that the total number of cases of cancer in the United States during any one year is, roughly, 420,000. Of these it may be expected that one-half, or 210,000, would require assistance in obtaining treatment for their condition. So far, in the State of Georgia, the average cost to the State for each case of cancer treated has been in the neighborhood of $40. This figure may be taken as a first approximation. Multiplying 210,000 by 40 would place the State contributions to the treatment of indigent sufferers from cancer for the whole country at $8,400,000. If 10 percent is added to this sum for administration, we have a total of $9,240,000. Dividing this by 48 we find that the average cost per State is approximately $200,000. In States with low density of population and low cancer death rate, this average figure would be considerably less. In the more densely populated States with higher cancer death rates, this State contribution would unavoidably be much higher. In the State of Georgia $50,000 was appropriated annually for 2 years by the State assembly which enacted the cancer law. Owing, however, to the State laws which provide that sums appropriated shall be expended only in the ratio of collected to expected State revenues, the sum available for 1938 was but $38,000. This sum is clearly inadequate to meet all the requests for State aid arising during the fiscal year. An increase in the amount budgeted for State aid in the treatment of cancer will be required if the degree of control over the cancer mortality rate contemplated by the law is to be exercised.

On the other hand, it is thought that an annual appropriation of $100,000 should yield satisfactory control over the cancer mortality rate in Georgia, and still constitute a reasonable expenditure in view of the importance of the objective. The relatively low cost of control measures in that State is, of course, due to the low cancer death rate and a correspondingly low level of incidence.

Besides the direct saving of life resulting from State aid in the treatment of cancer in the case of the indigent, it should not be forgotten that the improvement in the facilities for the treatment of the disease, the awakening of "cancer consciousness" in the general public, the education in the curability of early cancer, the education of the medical profession in the early diagnosis of cancer, therapeutic advances, the popularization of annual physical examinations during maturity, with the early detection of cancer in mind, all constitute forces making for the reduction of the cancer mortality rate in that portion of the population able to finance their own treatment. The cumulative effect of the factors just enumerated should be also reflected in significant reductions in cancer mortality.

SUMMARY AND CONCLUSIONS

The problem of reducing cancer mortality constitutes a major problem in public health and preventive medicine. The orienting experiences of forward-looking States in cancer control now justify the Nation-wide cooperation of the official health agencies of the Nation in instituting cancer control measures.

A central organization to furnish leadership, stimulus, training in the diagnosis and treatment of cancer, radium loans, and dissemination of professional and popular information exists already in the National Cancer Institute. Participation by States in the attack on cancer is best secured by organizing, in the several State departments of health, divisions of cancer control to put into operation specific measures within the State to effect reduction in the mortality rate from the disease.

These measures consist of popular education in the signs and symptoms of early cancer, improvement in the facilities for treatment, cooperation with State cancer commissions in educating the medical profession in the early diagnosis, maintenance of State services for the microscopical diagnosis of neoplasms, State aid to the indigent sufferers from cancer, and popularization of annual physical examinations in order to detect early cases.

The thoroughgoing Nation-wide application of such control measures should eventually effect a reduction of 25 to 30 percent in the cancer mortality rate, representing an annual saving of about 35,000 lives. This would offset the mortality due to automobile accidents.

The probable annual cost of such a Nation-wide attack upon cancer to the States would be in the neighborhood of $10,000,000.

EFFECTS OF INTRAMUSCULAR INJECTIONS OF VITAMIN B_1 ON ACUTE LEPROUS NEURITIS AND OF ORAL ADMINISTRATION ON THE GENERAL DISEASE

A Preliminary Report

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Comments relative to the relation of nutrition and diet to leprosy have appeared in the literature with increasing frequency in recent years. Some writers have suggested that deficiencies of certain of the vitamins apparently have some relation to the incidence of the disease. Others believe that there is a definite relation between the activity of the disease and a deficiency in some particular vitamin. A few investigators have attempted to show such a relationship by the administration of vitamins in various forms in clinical cases.

Wayson[1], in 1932, reported on his investigations of the therapeutic effect of the addition of a definite amount of an extract of wheat and of yeast to the customary diet of the patients. He selected 3 groups of about 20 patients each, whose ages and leprous conditions were comparable. One group received daily, for a period of 6 months, 15 grams of an extract of whole wheat evaporated to the consistency of a heavy syrup. The second group received, for the same period, 3 grams of a dried brewer's yeast, suspended in a coffee decoction. The third group served as controls. He found that patients in both of the treated groups showed changes which he stated might be rated as showing slightly greater improvement than that in those of the control group but felt that the differences were such as would not permit definite deductions.

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[1] Annual Report of the Surgeon General of the United States Public Health Service, 1932, p. 27.

Basu[2], noting occurrence of pellagra in lepers, analyzed their diet and found it to be deficient in proteins and in the vitamin B complex, particularly in vitamin B_2. Treatment with a vitamin B concentrate from yeast, adjusted to the strength of marmite, 1 teaspoon daily for a month or longer, he reports, caused marked improvement in sensation in cases with nerve involvement but had no effect in the nodular cases. He suggested that vitamin B_2 may be an important factor in the etiology of leprosy.

Brown [3] tested the value of giving vitamin B in the form of marmite and rice polishings. According to his statement no improvement resulted from the treatment.

During the past 2 years we have attempted to determine what effect the administration of vitamin B_1 might have on human cases of leprosy and have employed three preparations in our studies, namely, dried brewer's yeast, synthetic vitamin B_1 concentrate, by mouth, and aqueous solution of synthetic vitamin B_1, by injection. No improvement was noted which could be credited to the oral administration of yeast or vitamin B_1 concentrate. The results obtained following intramuscular injections of vitamin B_1 in cases of acute leprous neuritis are very encouraging.

Dried brewer's yeast.—Thirty-four patients, whose ages with two exceptions were under 20 years (two being just 20), were divided into two groups, one group to receive the yeast and the other to serve as a control group. The groups were selected as follows: A patient was placed in the group which was to receive the yeast, another patient of the same sex and age and having as nearly as possible the same type of disease and degree of involvement was placed in the control group. This procedure was continued until each group contained 17 patients. Four additional patients, for whom there were no suitable controls, also received the yeast.

Before the treatment was begun, a careful examination was made of each patient with particular attention to involvement of the peripheral nerves as shown by enlargements, muscular atrophies, contractions and disturbance of the superficial tactile and thermal sensations. The areas of disturbed sensation were plotted on anatomical charts.

Each patient in the test group was given twice daily 15 grams of the yeast [4] in pineapple juice. The 38 patients were seen frequently and carefully examined monthly to note any gross changes. After 3 months each was examined in the same manner as before the inauguration of the treatment. At this examination one-half of the body was tested carefully for any changes in the superficial tactile and thermal sensations. The treatment was continued for a total of 6 months, after which a complete examination was again made and any changes in the skin lesions, superficial nerves and superficial tactile and thermal sensations were noted on the charts.

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[2] Basu, N. K.: Ztschr. f. Vitaminforsch. Berne, 3: 194 (1934). Trop. Dis. Bull., 32: 335 (1935).

[3] Brown, James A. K.: West African Med. J., 8 :1. Trop. Dis. Bull., 33: 614 (1936).

[4] The potency of the yeast for vitamins B_1 and B_2 was tested on rats deficient in those vitamins and found satisfactory.

The results of the examinations revealed no improvement for which the administration of the yeast could be held responsible.

Vitamin B_1 concentrate by mouth.—A group of 11 children, from 4 to 17 years of age, were given a vitamin B_1 concentrate by mouth over a period of 6 to 8 months. Each received 800 international units daily. During the period of treatment they were frequently seen and examined once each month. As in the previous experiment, each patient was examined carefully before the inauguration of the treatment and at the termination of the period of observation and the findings were noted on anatomical charts. Other children in the hospital served as controls in this study. Two of the patients in this group were also in the group which had received 30 grams of brewer's yeast over a period of 6 months. A comparison of the findings of the two examinations revealed no improvement for which the administration of the vitamin B_1 concentrate could be held responsible. One showed definite improvement, the condition of one remained stationary and that of eight progressed. One of the treated group developed an acute neuritis after having received the concentrate for 8 months.

Acute leprous neuritis treated with intramuscular injections of vitamin B_1.—Acute neuritis is the one painful manifestation of leprosy. It may occur accompanying an acute leprous reaction or as the only acute manifestation of the disease at the time. In some cases a nerve may become markedly swollen, extremely painful, especially on movement of the parts involved, and acutely tender on slight pressure. In contrast to the very severe type there may develop a mild type of neuritis characterized by little swelling and slight tenderness accompanied by a neuralgic type of pain. The acute symptoms may continue for several weeks in some cases or, in a few, may subside in a week or so. Atrophies, contractures, and disturbed superficial sensations may appear as sequelae. Various methods and preparations have been employed in the treatment of cases of severe neuritis, including complete rest of the affected part and the administration of sedative drugs ranging from the mild analgesics to the opiates, as well as injections of adrenalin and ephedrine. Some cases will respond rather readily to these forms of treatment, while in others the neuritis may persist for periods of from 1 to 2 months, with severe suffering for the patient.

During the past few years, investigators have reported rather striking success in the treatment of various forms of neuritis following injections of vitamin B_1. In view of these most encouraging reports, it was thought advisable to study the value of such treatment in cases of acute leprous neuritis.

During the past 6 months 10 patients with rather severe acute neuritis of peripheral nerves have been treated with intramuscular injections of vitamin B_1. The injections were begun as soon as possible after the onset of symptoms, or when the patient first complained of pain. In seven the first injection was given on the day of onset, in one on the second, in one on the fourth, and in one on the fifth day after onset of symptoms. With one exception the procedure followed was to give 300 international units once daily by intramuscular injection and twice daily by mouth. In the exception, a case of very severe neuritis (No. 10), 600 units instead of 300 were given by injection. The first effect noted was relief of pain and then tenderness. About the time that the tenderness had completely disappeared, a diminution in the swelling was noted.

In the 7 patients in whom the injections were begun on the day of onset, the pain had completely disappeared 24 hours after the first injection in 4, in 48 hours in 1, and on the fourth day in another. In one patient, owing to a required emergency treatment, the injections were discontinued after two had been given. On the third day in this case the pain was moderate, after which it continued to lessen in severity until the seventh day, when it was no longer present. Tenderness could no longer be elicited after 24 hours in one and after 3 or 4 days in all but the one patient in whom the treatment was interrupted. In this case no tenderness could be elicited on the seventh day. In each case the tenderness was less marked 24 hours after the first injection. Definite diminution in the swelling was first noted about the time that the tenderness disappeared.

In one case, No. 10, the injection treatment was begun on the second day of symptoms. Twenty-four hours after the injections the pain had definitely lessened, while the tenderness and swelling remained prominent. After three injections the pain had entirely disappeared, and after four injections the tenderness had completely disappeared and definite diminution in the amount of swelling had taken place.

In two cases, Nos. 4 and 9, the injections were begun on the fourth and fifth days of symptoms. In the former the response to treatment was not as abrupt and the improvement was not sharply defined from day to day. On the third day, however, there was considerably less pain, but the nerve was still quite tender and swollen. Definite decrease in the size of the nerve was not noted until after nine injections had been given, at which time there was but slight tenderness. In the other case, in which the injections were begun on the fourth day of symptoms, the results were about as prompt as in the majority of the cases.

CASE REPORTS

Case 1, No. 3361.—Female, part-Hawaiian, aged 25 years. This patient was first admitted to segregation in April 1929 at the age of 14 with early, bacteriologically negative, neural leprosy. She was released from segregation in December of the same year after 8 months' hospitalization and readmitted in November 1935 at the age of 23, with moderately advanced, bacteriologically positive, mixed leprosy.

During the present hospitalization she has had several prolonged periods of activity, alternating with periods of relative quiescence. The skin lesions have progressed, chiefly during periods of activity, developing into the filtrative type.

On September 2, 1937, while the skin lesions were subsiding from a 4-month period of activity, there developed an acute neuritis of the right ulnar nerve characterized by acute pain, accentuated by movement at the elbow, severe tenderness on slight pressure, definite enlargement throughout its palpable course, and accompanied by no increased activity of the lesions of the skin. Administration of vitamin B_1 was started on the first day of the neuritis, 300 international units by intramuscular injection daily and 300 orally twice daily.

September 3, second day: Considerable decrease was noted in the amount of pain both on motion and while at rest. Rather marked tenderness persisted with no notable change in the swelling.

September 5, third day: The pain and tenderness had completely subsided.

September 7, fifth day: Definite decrease in the amount of swelling was noted. The vitamin B_1 therapy was discontinued. The patient had been given 5 daily injections and oral administrations during the same period.

Following the discontinuance of the therapy the nerve continued to decrease in size until it apparently returned to that previous to the attack. There has been no recurrence during 6 months.

Case 2, No. 3480.—Female, part-Hawaiian, aged 53 years. First admitted to segregation in April 1929 at the age of 45 years with moderately advanced, bacteriologically negative, maculo-anesthetic leprosy. She was released from segregation in November 1930 after 20 months' hospitalization. This patient was readmitted in July 1937 at the age of 53 with the same type of leprosy but more advanced than on first admission. Three months before admission there had developed a left foot drop. Since admission there has been steady regression of visible activity in all of the lesions with no improvement in the foot drop.

On September 27, 1937, there developed an acute neuritis of the left external peroneal nerve characterized by acute pain, accentuated by both active and passive movements at the knee, severe tenderness on slight pressure, and marked enlargement, and accompanied by no increase in the activity of the skin lesions. The size of the external peroneal was estimated to be approximately twice that existing prior to the onset of the neuritis. Administration of vitamin B_1 was begun, 300 international units by intramuscular injection once daily and 300 orally twice daily.

September 28, 24 hours after beginning of treatment, the pain had entirely disappeared, both while at rest and on movement, and the tenderness had definitely decreased. There was no perceptible change in the size of the nerve.

On September 29, after 3 days of the vitamin B_1 therapy, there was present neither pain nor tenderness on firm pressure, and the size of the nerve had apparently returned to that previous to the attack. The injections were discontinued. There has been no recurrence during the 6 months since the injections were discontinued and no improvement in the old foot drop.

Case 3, No. 3333.—Female, Hawaiian, aged 48 years. Admitted to segregation in March 1935 with advanced, bacteriologically positive, mixed leprosy.

On September 28, 1937, after the patient had definitely entered the recessive stage following a 3 months' period of increased activity, there developed an acute neuritis of each of the external peroneal nerves, characterized by pain, tenderness, and swelling. Three months previously, at the onset of the period of activity, the dorsiflexors of each foot had become paralyzed, resulting in a biliateral foot drop and accompanied by no symptoms of acute neuritis. Daily administration of vitamin B_1 was begun, 300 international units intramuscularly and 600 orally.

On September 29, 24 hours after onset of treatment, the pain and tenderness had entirely disappeared. The injections were changed to 3 weekly and the oral administration continued twice daily.

On November 15, after 8 weeks of the vitamin B_1 administration, there was noted slight return of dorsiflexion at both ankles after 5 months of complete foot drop. By February 1938 the return of function was practically complete.

Case 4, No. 3430.—Female, part-Hawaiian, aged 11 years, was admitted to segregation in December 1936, at the age of 10, with moderately advanced, bacteriologically positive, mixed leprosy. The lesions were of both the maculo-anesthetic and infiltrative cutaneous types.

On October 13, 1937, there developed an acute neuritis of the right ulnar nerve, characterized by pain, tenderness, and swelling extending from just below the elbow to the upper third of the humerus.

On October 16, after 3 days of acute symptoms, during which there was noted no improvement, a course of treatment was instituted. Three hundred international units were given daily by intramuscular injection and 300 units twice daily by mouth. Response to treatment was not as abrupt in this case as in the preceding cases, and improvement was not sharply defined from day to day. However, by the third day there had occurred considerable decrease in the pain, especially in that experienced on movement. The nerve was still quite tender and swollen. Definite decrease in the size of the nerve was not noted until the treatment had been continued for 10 days, when only slight tenderness remained. The injections were stopped after 11 doses and the oral administration was continued.

Case 5, No. 3470.—Male, Portuguese, aged 33 years, was first admitted to segregation in 1918 at the age of 14. He was released from segregation in 1920, and after 17 years was readmitted in July 1937, with advanced bacteriologically positive, mixed leprosy, complicated by active pulmonary tuberculosis. He has been in bed continuously since admission.

On October 14, 1937, there developed an acute neuritis of the left ulnar nerve, characterized by extreme pain, accentuated by movement, severe tenderness, and marked swelling. The point of maximum tenderness was located about 3 inches above the elbow, where a tense fusiform enlargement could be palpated.

Vitamin B_1 therapy was instituted—300 units daily intramuscularly and 300 units by mouth twice daily.

On October 15, 24 hours after receiving the first injection, there was a definite decrease in the amount of pain and tenderness, with no palpable change in the size of the nerve.

On October 17, after 3 days of treatment, pain was elicited only on movement and the tenderness was slight.

On October 18, fourth day of treatment, all pain and tenderness had disappeared and the acute swelling of the nerve was subsiding.

Case 6, No. 3453.—Male, Japanese, aged 23 years, was admitted to segregation in June 1937 at the age of 23, with far advanced, bacteriologically positive, cutaneous leprosy, nodular type, and extensive neural involvement.

On November 12, 1937, during a period of acute leprous activity, there developed an acute neuritis of the right external peroneal nerve, characterized by severe pain at rest and on movement, with tenderness and swelling being most severe at the point where it crosses the fibula. The administration of vitamin B_1 was begun by injecting intramuscularly 300 international units daily and giving 300 units twice daily by mouth.

On November 13, 24 hours after the first injection, the pain both at rest and on movement had disappeared, while the nerve was still quite tender to pressure. No apparent decrease in size was noted.

On November 14, the third day of the attack and treatment, the tenderness had definitely decreased.

On November 15, the fourth day, all acute tenderness had disappeared and a recession in the amount of swelling was noted. The injections were discontinued, a total of four having been administered. The oral administration was continued for two additional days.

Case 7, No. 3484.—Male, Japanese, aged 23 years, was admitted in November 1937 with bacteriologically positive, mixed leprosy, characterized by advanced cutaneous lesions and nerve involvement.

On November 22, 1937, during a severe acute leprous reaction accompanied by pronounced prostration, there developed an acute neuritis of the right ulnar nerve. The pain was very severe and constant, stabbing in character on passive and active movement. Tenderness was marked, with the point of maximum intensity approximately two inches above the elbow, where a fusiform swelling was evident. The vitamin B_1 therapy was instituted—300 units once a day by intramuscular injection and twice daily by mouth.

On November 23, the third day, the pain was moderate and the nerve was still enlarged and quite tender. At that time a condition, unrelated to the neuritis, developed which required emergency treatment and necessitated discontinuation of the vitamin treatment. However, there was no return of the intense pain of the first day and the tenderness gradually subsided until it was no longer present on the seventh day, at which time the swelling was also subsiding.

On December 13, 3 weeks after the onset of the neuritis and 19 days after discontinuance of the vitamin B_1 therapy, there developed a recurrent attack of the neuritis of the right ulnar nerve accompanied by acute neuritis of the left ulnar and both external peroneal nerves, with about the same intensity in each as was experienced with the first attack. Daily administrations of 300 units of the vitamin intramuscularly and 600 by mouth were again begun.

Within 24 hours of the first injection all pain had disappeared and within 4 days all tenderness had disappeared and the swelling had begun to subside. Improvement developed in the three nerves concurrently. After the fourth day the number of injections was changed to three times a week. No recurrences have taken place during two and one half-months on this regime.

Case 8, No. 3457.—Female, part-Hawaiian, aged 50 years, was admitted to segregation in May 1937 with bacteriologically positive, mixed leprosy in which neural manifestations predominated. Included among the neural findings were bilateral drop of wrist and foot.

On December 6, 1937, there developed an acute neuritis of both external peroneal nerves, with pain, tenderness, and swelling of about the same intensity in each, and evident chiefly where the nerves lie over the upper portion of the fibulae. The vitamin B_1 therapy was begun with the daily administration of 300 units intramuscularly and 600 units by mouth daily.

On December 9, the third day of treatment, the pain had completely disappeared, and on the following day the tenderness had likewise disappeared. The swelling was definitely subsiding on the tenth day of treatment.

The injections were continued for a total of 16 days, and the oral administration to date, 3 months after the attack, with no recurrence of acute neuritis and no clearing of the paralyses.

Case 9, No. 3416.—Female, part-Hawaiian, aged 13, was admitted to segregation in October 1936 at the age of 12, with advanced, bacteriologically positive, mixed leprosy.

On January 24, 1938, there developed an acute neuritis of the right ulnar and right radial nerves, characterized by pain, tenderness, and swelling. The maximum point of tenderness and swelling of the ulnar nerve was just above the elbow, and that of the radial at the wrist, where the superficial branch was palpable over the distal portion of the radius.

On January 28, the fourth day after onset, there had been no noticeable improvement, and so an intramuscular injection of 300 international units of vitamin B_1 was given.

On January 29, 24 hours after the injection, there was still some pain on movement but none while the arm was at rest. Both nerves were still quite tender, with no palpable decrease in the swelling.

On January 31, 3 days after the injection, all pain had disappeared and the swelling of both nerves was subsiding. Slight tenderness to pressure was still present, so another injection of 300 units was given.

On the following day, February 1, all tenderness had disappeared. Injections of 300 units had been given on the fourth and seventh days after onset.

The patient had had a previous attack of acute neuritis. One week after admission she had an attack of acute neuritis of the left ulnar nerve, with pain, severe tenderness, and marked swelling. The treatment consisted of complete rest in bed with the arm elevated in a sling and protected from motion and trauma. It was not until 20 days after the onset that the pain and tenderness had disappeared and the swelling had begun to subside.

Case 10, No. 3142.—Female, part-Hawaiian, aged 25, was admitted to segregation in April 1932, at the age of 19, with moderately advanced, bacteriologically positive, mixed leprosy. Since admission the disease has progressed and is at present classed as advanced. This patient has also developed advanced pulmonary tuberculosis and tuberculosis of the spine with psoas abscess formation.

On March 10, 1938, there occurred an acute neuritis of the left ulnar nerve, characterized by paresthesias and severe pain. The patient did not report the condition until the day after onset.

On March 11 there was severe pain, accentuated on slight movement. The tenderness was extreme. There was definite enlargement of the nerve, the extent of which could not be determined on account of the extreme tenderness. The administration of vitamin B_1 was begun, with daily administrations of 600 units both orally and intramuscularly.

On March 12, the third day of the neuritis and 24 hours after the first injection of 600 units, there was very little pain, spasmodic in character and of short duration, with arm at rest. Painless motion was possible at the elbow between extension and 90° flexion. The tenderness and swelling remained prominent.

On March 13, after 2 injections, the pain with the arm at rest had disappeared, and the arm could be painlessly flexed at the elbow to within approximately 15° of complete flexion. Tenderness was slightly less.

On March 14, after 3 injections, the pain had entirely disappeared while at rest or on movement. The tenderness and swelling had definitely decreased.

On March 15, after 4 injections, pain and tenderness were no longer present and the swelling had apparently subsided. The injections were continued through March 17 for a total of 7 daily doses.

DISCUSSION

The results obtained in the few cases of acute leprous neuritis reported here strongly suggest that material benefit is derived from intramuscular injections of vitamin B_1. Our experience also suggests that similar results are not obtained by the oral administration of that vitamin. No improvement was noted following administration, for over a 6-month period, either of large doses of brewers' yeast or of vitamin B_1 concentrate. On the contrary, acute neuritis developed after the vitamin B_1 concentrate was given, in one case for 6 months (case 4) and in another for 8 months (case 9).

In this preliminary study all patients suffering with acute neuritis were treated by injections of vitamin B_1 and no parallel control cases were followed. However, our records of a few cases treated by other methods in the past suggest that the duration of the acute symptoms was apparently much longer than in these treated cases. In one of this series of cases (case 9) there had occurred a previous attack of acute ulnar neuritis in which the pain and tenderness had persisted for 24 days, while the duration of pain in the present attack was for but 3 days and of tenderness for 4 days after vitamin B_1 injections had been begun. In 5 other cases of neuritis the acute symptoms persisted for periods of from 14 to 27 days. This study is being continued with a change in procedure. Alternating cases will be treated with the vitamin B_1 injections, while the others will be treated by the methods previously employed.

The effects of this injection treatment on old manifestations of nerve involvement is problematical. In one case in which there had been a bilateral foot drop previous to the onset of the acute neuritis, there occurred definite improvement following the injection treatment. However, similar results have been obtained in cases treated otherwise.

A study to determine, if possible, what prophylactic value the injection of vitamin B_1 might have is in progress. It is hoped that, by such injections, attacks of acute neuritis may be prevented.

It is likewise hoped that, by shortening the course of the acute neuritis, complications, such as atrophies and contractures, may be prevented.

No attempt will be made at this time to explain the mode of action of the vitamin B_1 following intramuscular injection in these cases of neuritis. We believe, however, that there is lacking evidence which would suggest that the acute neuritis is due to a specific vitamin B_1 deficiency. One patient (case 4) had received vitamin B_1 concentrate, 300 international units 3 times weekly for 6 months, and was still receiving the concentrate when there developed an acute neuritis. Another case (No. 9) had been receiving 600 international units daily for a period of 8 months when she developed an acute neuritis.

This case was in the group in which the effects of oral administration of the vitamin B_1 concentrate were studied. If the vitamin was being absorbed from the intestinal tract, the possibility of a vitamin B_1 deficiency in these two cases appears remote.

The very sudden onset with marked edema and swelling of the nerves suggests that toxicity plays an important role in these cases of leprous neuritis. Further investigations might show that the injection of vitamin B_1 may have some action relative to toxicity.

CONCLUSION

A small series of cases of acute leprous neuritis has been treated with intramuscular injections of vitamin B_1 with rather spectacular results. The study must be continued on a large group of cases, well controlled, before the value of such treatment can be determined definitely.

STUDIES ON OXYURIASIS

XVI. THE NUMBER OF EGGS PRODUCED BY THE PINWORM, *ENTEROBIUS VERMICULARIS*, AND ITS BEARING ON INFECTION[1]

By Lucy Reardon, *Junior Zoologist, National Institute of Health, United States Public Health Service*

In connection with the life history of *Enterobius vermicularis* it has been noted in previous papers in this series (*1*, *2*, *3*) that the gravid female migrates from the rectum through the anus to the perianal region and deposits her eggs on the skin, and that these eggs become scattered throughout the household, resulting in familial infections (*4*). Unpublished findings indicate that eggs can be recovered, by suitable techniques, from floors, rugs, chairs, beds, and other places. It is desirable that we have some mental picture of this in order to estimate the danger of infection. We know that an infection may be so light that there may be a migration of only one worm in the course of several days, or so heavy that a considerable number of worms may migrate every night. If we know the number of eggs produced by each gravid female, we can then form an estimate as to the probable extent of the household infection resulting from the presence of one infested individual or several such individuals. To ascertain the number of eggs produced by a female worm, actual counts of eggs in 20 gravid specimens of *Enterobius vermicularis* have been made. The technique is here described, previous records in the literature are noted, and the present counts are discussed.

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[1] Other studies of this series:

I. Types of anal swabs and scrapers, with a description of an improved type of swab. By Maurice C. Hall. Am. J. Trop. Med., 17: 445–453 (1937).

II. A preliminary note on treatment with tetrachlorethylene. By Willard H. Wright, John Bozicevich, and Joseph Rose. Virginia Med. Monthly, 64: 339–341 (1937).

III. The incidence of pinworm infestation in a group of 230 boys in Washington, D. C. By John Bozicevich. Med. Ann. District of Columbia, 6: 239–241 (1937).

IV. Some aspects of the problem of therapy. By Willard H. Wright and Eloise B. Cram. Am. J. Dis. Children, 54: 1276–1284 (1937).

V. Therapy with single doses of tetrachlorethylene. By Willard H. Wright, John Bozicevich, and Leon S. Gordon. J. Am. Med. Assoc., 109: 570–573 (1937).

VI. The incidence of oxyuriasis in 1,272 persons in Washington, D. C., with notes on diagnosis. By Eloise B. Cram, Myrna F. Jones, Lucy Reardon, and Mabelle O. Nolan. Pub. Health Rep., 52: 1480–1504 (1937).

VII. Clinical improvement following treatment with single doses of tetrachlorethylene. By Willard H. Wright, John Bozicevich, and Leon S. Gordon. Am. J. Trop. Med. (In press.)

VIII. A preliminary note on therapy with gentian violet. By Willard H. Wright, Frederick J. Brady, and John Bozicevich. Proc. Helm. Soc., Wash., 5: 5–7 (1938).

IX. The familial nature of pinworm infestation. By Eloise B. Cram. In manuscript.

X. Artifacts in "cellophane" simulating pinworm ova. By Lucy Reardon. Am. J. Trop. Med., 18: (1938). (In press.)

XI. Dermal and intradermal skin reactions in oxyuriasis. (By title.) By Willard H. Wright and John Bozicevich. J. Parasitol., 23: 562 (1937).

XII. Epidemiological findings in Washington, D. C. By Eloise B. Cram and Lucy Reardon. In manuscript.

XIII. Problems presented by a family of seven, all infested with pinworms. By Myrna F. Jones, Eloise B. Cram, and Willard H. Wright. In manuscript.

XIV. Controlled tests with various methods of therapy. By Williard H. Wright, Frederick J. Brady, and John Bozicevich. In manuscript.

XV. A study of 504 boys in a boys' camp. By John Bozicevich and F. J. Brady. Med. Ann. District of Columbia. (In press.)

TECHNIQUE

The majority of worms were fixed in 10 percent formalin; two were fixed in Bouin's, and one in hot alcohol; approximate measurements of the worms were made with a stage micrometer and dissecting microscope; to intensify definition of ova, all worms, previously soaked in N/10 NaOH for about 24 hours, were stained for an equal time in the blue rayon dye which has been discussed by Hall (*5*); counts were made on specially manufactured rhodium-plated 2-inch by 3-inch slides outlined in 1-mm squares.

On each of four ruled slides, three drops of glycerin from a dropping bottle (pipette form) were placed. A stained worm was put on one slide in the glycerin. Under the lens of the dissecting microscope the worm was cut with an iris knife into approximate quarters, one of which was left on the slide, and three of which were deposited severally in the glycerin on the three remaining slides. Each portion of worm was teased with iris knife and dissecting needle until all ova were dispersed somewhat evenly. Knife and needle were stroked on the slide near the egg-laden glycerin to free them from adhering eggs, and 24 by 50 mm cover slips were applied to the preparation. These preparations will keep for days in condition for counts if protected from dust and jolts. Ova were counted under a compound microscope with 5 X oculars and 16 mm objective, and tallied with a Veeder hand counter.

Prior to adoption of this technique, counts on five worms were made by the author and other members of the staff. In making these counts, eggs were pipetted from a container to a slide; but this method was not accurate, since many ova adhered both to the pipette and the container and it was impossible to make an accurate count of the eggs. For this reason, these counts, which were, respectively, 8,013, 7,197, 6,144, 16,105, and ca. 8,000 are not included in the accompanying table. However, these counts are all within the range of the figures for the counts in the table.

PREVIOUS RECORDS

Four of the published references on the number of ova in a gravid specimen of *Enterobius vermicularis* (*6*, *7*, *8*, *9*) are based on Leuckart (*10*), and cite 10,000 to 12,000 for the number of ova in a mature female. These figures were used by Leuckart in reference to a worm partially filled with eggs. In a footnote he calculated the number to be not less than 20,000.[2] Cobb (*11*) also cites 20,000 as a moderate estimate of the number of eggs in an adult female. Fiebiger (*12*) says that the mature female is completely filled with 8,000 to 12,000 eggs. Wilhelmi and Quast (*13*) made actual counts on two worms and enumerated 12,946 and 12,768 eggs, respectively. Miretsky (*14*), in estimating the number of eggs in *Enterobius vermicularis*, used a 10-percent solution of caustic soda to destroy the worm tissues and leave free the eggs. A suspension of the eggs was obtained and their number calculated with blood-counting pipette and chamber. The number of eggs so calculated is stated to be from 13,000 to 16,000.

PRESENT COUNTS

Table 1 shows the results of counts of 20 worms:

TABLE 1.—*Egg counts, together with source and size of worms, for Enterobius vermicularis*

Number of ova	Source of worm	Approximate size of worm
14,451	Stool (after gentian violet treatment)	9.7 mm by 0.4 mm.
14,816	do	9.3 mm by 0.4 mm.
14,703	do	9.2 mm by 0.3 mm.
14,898	do	Not recorded.
16,451	do	Do.
11,024	Colon (from necropsy)	9.4 mm by 0.5 mm.
6,345	do	9.4 mm by 0.4 mm.
10,507	do	9.0 mm by 0.4 mm.
8,506	do	9.0 mm by 0.4 mm.
8,790	do	8.8 mm by 0.4 mm.
8,706	do	8.8 mm by 0.4 mm.
12,782	Rectum (direct extraction)	8.1 mm by 0.4 mm.
4,902	do	7.5 mm by 0.4 mm.
7,608	do	7.0 mm by 0.4 mm.
4,672	do	6.7 mm by 0.3 mm.
6,028	do	Not recorded.
13,911	do	Do.
14,206	do	Do.
16,888	do	Do.
11,810	Enema	9.0 mm by 0.4 mm.

Arithmetical mean: 11,105; mean of the extremes: 10,780.

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[2] Leuckart (*10*), p. 317 and footnote (translation), p. 317:

"The eggs of our parasite have, as is well known, an oval shape and relatively large size (length=0.05 mm., greatest breadth=0.016 mm.), which nevertheless does not prevent their number from amounting, constantly, to between 10-12,000 in a female with a uterus only somewhat well filled."

Footnote: "If the body of our worm with a diameter of 0.4 mm. and a length of 5 mm. is assumed to be filled with eggs (globules of 0.04 mm.) as stated above, the number contained therein is calculated to be not less than 20,000!"

The foregoing figures are strikingly variable, ranging from a low count of 4,672 to a high count of 16,888. This variation might follow, for one thing, in worms collected from stools, as a result of oviposition having begun and continued to some extent. It might follow, in worms collected from the colon at necropsy, from the fact that worms in various stages of development are found there. However, in worms extracted directly from the rectum the great variation found was not anticipated. It seemed reasonable to assume that such worms had reached their peak in development; that oviposition had not occurred, and that any normal variation in the egg count of fully developed worms might be slight. Nevertheless, this last group showed the greatest variation and included, not only the smallest worm, but also the highest and lowest egg counts. In the one enema reported in the table, formaldehyde, in a concentration strong enough to fix the worms promptly and thus prevent oviposition, was added immediately to the enema returns. Unfortunately, it has not been possible to obtain more worms collected in this way.

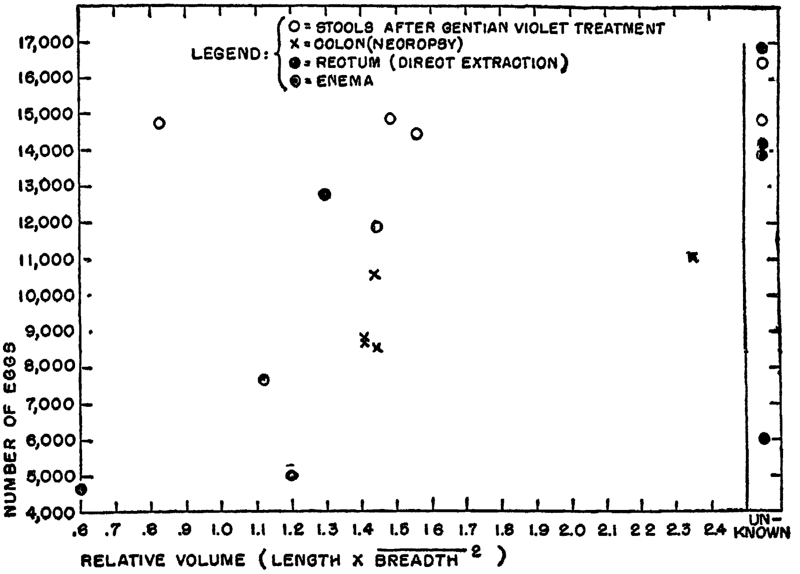

FIGURE 1.—Egg counts as correlated with worm sizes and source of worms.

Figure 1 indicates that worms having the highest development, both as to volume and to egg content, were obtained from stools after treatment with gentian violet. It shows also that some depletion of eggs may have occurred in worms extracted from the rectum; this may have occurred as the result of oviposition due to unusual stimulation attending the collection of the worms. However, the number of worms counted is not large enough to rule out the possibility that our selection of worms from any source might not be representative of the variation in egg counts for material from that source.

Whether this variation in egg content of gravid females represents a normal variation in individual egg production, or whether the variation is concurrent with the development of the worm, and following from the unintentional inclusion of females not yet completely gravid or partially depleted in our specimens, is not certain. Many published measurements of the female pinworm range from 8 to 13 mm by 0.3 to 0.5 mm, with no evidence as to the size range for gravid females. The variation in egg count may be correlated to some extent with the size of the worm, and both may be highly variable in normal fully gravid females. This correlation, however, is not established in figure 2. The possibility is indicated, but the number of worms is too small to settle the question one way or another. Leuckart's and Cobb's (*10, 11*) estimates of 20,000 eggs are above our highest egg count for a measured worm—14,816 eggs in a worm 9.3 mm long; but it seems reasonably likely that a worm 13 mm long might well contain 20,000 eggs.

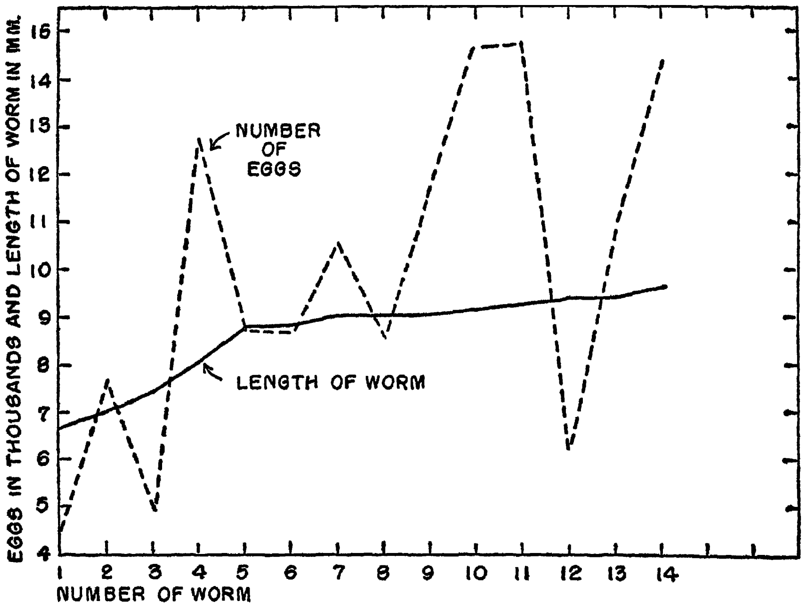

FIGURE 2.—Egg counts as correlated with length of worms.

It is clear from previous findings and from this study that an infested household may have many thousands of eggs scattered about in it, and that the danger of infection from so much infective material is very real. Cobb (*11*), on the subject of "contagion" in oxyuriasis, says: "The abundance of the eggs about dwellings, &c., is difficult to overstate, and is easily illustrated by a calculation. Reckoning 50 female worms to the individual [with 20,000 eggs in each female], an average which I am certain is exceeded in many localities, we have for a population of 250,000, the enormous number of two hundred and fifty thousand million eggs, which if distributed evenly over 20 square miles, would furnish *four to five hundred eggs to the square foot.*" If we take the arithmetical mean of our egg counts as 11,000 eggs in round numbers, then a comparatively light case of oxyuriasis with a migration of 5 worms daily would imply the presence, in a household, of 385,000 eggs within a week's time. Such figures would explain why we find a high incidence in our studies in Washington (*3*), and why this worm has been regarded by competent parasitologists for many years as the most common of all pathogenic animal parasites of man.

SUMMARY

Counts, made by rather precise techniques, of the eggs present in 20 gravid females of *Enterobius vermicularis* show from 4,672 to 16,888 eggs per worm. The arithmetical mean is 11,105, and the mean of the extremes is 10,780. These figures, in connection with studies on the recovery of pinworm eggs from households, afford some explanation of the familial nature of oxyuriasis, and the status of pinworms as the most common of all the pathogenic worm parasites of man.

REFERENCES

(*1*) Bozicevich, John: Studies on oxyuriasis. III. The incidence of pinworm infestation in a group of 230 boys in Washington, D. C. Med. Ann. Dist. of Col., **6**: 239–241 (August 1937).

(*2*) Wright, Willard H., and Cram, Eloise B.: Studies on oxyuriasis. IV. Some aspects of the problem of therapy. Amer. J. Dis. Child., **54**: 1276–1284 (December 1937).

(*3*) Cram, Eloise B., Jones, Myrna F., Reardon, Lucy, and Nolan, Mabelle O.: Studies on oxyuriasis. VI. The incidence of oxyuriasis in 1,272 persons in Washington, D. C., with notes on diagnosis. Pub. Health Rep., **52**: 1480–1504 (Oct. 22, 1937).

(*4*) Jones, Myrna F., Cram, Eloise B., and Wright, Willard H.: Studies on oxyuriasis. XIII. Problems presented by a family of seven, all infested with pinworms. In manuscript.

(*5*) Hall, Maurice C.: Studies on oxyuriasis. I. Types of anal swabs and scrapers, with a description of an improved type of swab. Am. J. Trop. Med., **17**: 445–453 (May 1937).

(*6*) Koch, E. W.: Oxyurenfortpflanzung im Darme ohne Reinfektion und Magenpassage. Centralbl. f. Bakt., I Abt. Orig., **94**: 208–236 (1925).

(*7*) Mosler, F., and Peiper, E.: Thierische Parasiten. Spec. Path. u. Therap., v. 6, Nothnagel, Wien. 1894.

(*8*) Neveu-Lemaire, M.: Traité d'helminthologie médicale et vétérinaire. Vigot Frères, Paris. 1936.

(*9*) Railliet, A.: Traité de zoologie médicale et agricole. 2nd ed. Asselin et Houzeau, Paris. 1895.

(*10*) Leuckart, Rudolph: Die menschlichen Parasiten, etc., v. 2, pt. 2, pp. 257–512. C. F. Winter, Leipzig and Heidelberg. 1868.

(*11*) Cobb, N. A.: Oxyuris-larvae hatched in the human stomach under normal conditions. Proc. Linn. Soc. N. S. Wales, **5** (2d. ser.): 168–185 (Mar. 26, 1890).

(12) Fiebiger, Josef: Tierische Parasiten. 3rd. ed. Urban and Schwarzenberg, Berlin & Wien. 1936.
(13) Wilhelmi, J., and Quast, Marg.: Über die Verbreitung und den Nachweis der Oxyuriasis. Klin. Wchnschr., 4: 964–967 (May 14, 1925).
(14) Miretsky, O. J.: A method for calculating the eggs contained in the body of helminths. [In Russian.] Papers on Helminthology published in commemoration of Professor K. J. Skrjabin. 396–397 pp. Published by the All-Union Lenin Academy of Agricultural Sciences, Moscow. 1937.

ROCKY MOUNTAIN SPOTTED FEVER

Geographical and Seasonal Prevalence, Case Fatality, and Preventive Measures

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As is frequently the case with geographically named diseases, Rocky Mountain spotted fever is found far distant from the locality from which it received its name, or at least part of its name. When first identified, it was thought to be limited to the northwest mountainous section of the United States. For many years it was believed to be limited to the States west of the Mississippi River. In 1930, however, investigators of the United States Public Health Service discovered that the disease was occurring in the eastern part of the country, in the States along the Atlantic seaboard; and it is probable that it is found in other countries identified by other names.

Although the type of Rocky Mountain spotted fever found in the East was proved to be identical immunologically with the Western type, certain clinical variations were noted which indicated that the eastern form of the disease was somewhat less virulent than that found in some areas of the Western States, at least before prophylactic measures were discovered and adopted there. In all parts of the country the disease is transmitted to human beings principally by the bite of the wood tick, *Dermacentor*—the western disease by the species *andersoni* and the eastern type by the species *variabilis*, the common dog tick. Careful experimentation has shown that infected ticks pass the disease from one generation to the next; and thus there is provided a continuing reservoir of infection.

SYMPTOMS

The descriptive part of the name of this disease comes from the characteristic irritating rash which accompanies it. In the typical case, as described by the director of the Rocky Mountain Laboratory of the United States Public Health Service, from 2 to 5 days elapse between the time when the patient is bitten by the infected tick and the appearance of the first symptoms. In milder cases, from 3 to 14 days may elapse. The onset of the disease is accompanied by a distinct chill, and usually certain other symptoms such as headache, sweating, redness of the eyes, pain in the abdomen, the bones, and the muscles, and sometimes nosebleed and vomiting. This combination causes a very severe illness. Some patients may become delirious and show symptoms indicating that the brain and spinal cord are affected.

When the physician examines the patient with Rocky Mountain spotted fever he will likely find that the spleen and some of the lymph glands are enlarged, and will notice the typical rash. This rash gives a mottled appearance to the skin and is most often seen on the wrists, ankles, and less frequently on the back. Occasionally the eruption will be observed on the forehead. In some cases the disease is so severe that the rash, or eruption, is purplish red in appearance, which is due to release of blood into these areas.

The fever usually lasts two or three weeks, but may continue longer. If the condition becomes worse, the temperature goes higher and the fever is persistent. Along with the fever, the pulse becomes strong and fairly rapid. These patients are restless and find it difficult to sleep. The skin is oversensitive, and there may be pains along the course of the nerves.

Laboratory tests have been developed which easily differentiate Rocky Mountain spotted fever from scarlet fever, measles, typhoid fever, typhus fever, meningitis, encephalitis, or any other disease that it may resemble; and by such means it can be diagnosed with certainty.

GEOGRAPHICAL AND SEASONAL PREVALENCE

In table 1 are presented the number of cases reported to the Public Health Service and the number of deaths recorded by the Bureau of the Census for the years 1933–37, by States arranged according to geographical regions.

The areas of greatest prevalence of Rocky Mountain spotted fever in the United States during the 5 years 1933–37 are the Mountain and Pacific States and the South Atlantic States. Of the 2,190 cases reported for the entire country during those years, 1,435 cases, or 65.5 percent, occurred in the Mountain and Pacific States, and 601 cases, or 27.4 percent occurred in the South Atlantic group. These two areas combined accounted for 93 percent of the total number of cases reported for the entire country.

The known area of prevalence in the United States has gradually been extended to include all geographic regions, as shown in table 1, the New England group being the last to recognize its occurrence, two cases being reported in Rhode Island in 1937. In 1933, the disease was reported in 23 States; in 1934, in 25 States; in 1935, in 25 States; in 1936 in 28 States; and in 1937, in 31 States (including the District of Columbia in each year).

Rocky Mountain spotted fever has a characteristic seasonal curve in the United States, correlated with the habits and prevalence of the tick and with the vacation season. The greatest numbers of cases are reported during the spring and summer months, when the adult ticks are seeking an animal host and normally increased outdoor activities and vacation time bring the period of maximum exposure of human beings to the sources of infection.

TABLE 1.—*Cases of, and deaths from, Rocky Mountain spotted fever in the United States, 1933–37*[1]

State	1933		1934		1935		1936		1937 [2]	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
New England:										
Maine	0	0	0	0	0	0	0	0	0	--------
New Hampshire	0	0	0	0	0	0	0	0	0	--------
Vermont	0	0	0	0	0	0	0	0	0	0
Massachusetts	0	0	0	0	0	0	0	0	0	--------
Rhode Island	0	0	0	0	0	0	0	0	2	0
Connecticut	0	0	0	0	0	0	0	0	0	0
Middle Atlantic:										
New York	3	0	4	2	------	0	1	0	2	0
New Jersey	0	0	0	0	1	0	4	0	8	2
Pennsylvania	2	0	1	0	3	1	4	0	2	--------
East North Central:										
Ohio	0	0	0	0	0	0	0	0	2	--------
Indiana	1	0	0	0	0	0	0	0	1	0
Illinois	0	0	1	1	2	0	6	2	6	1
Michigan	0	0	0	0	0	0	0	0	0	0
Wisconsin	0	0	0	0	0	0	0	0	0	0
West North Central:										
Minnesota	1	0	0	0	1	0	1	0	0	0
Iowa	5	1	6	0	7	1	1	1	16	3
Missouri	0	0	------	1	0	0	0	0	0	0
North Dakota	0	0	0	0	2	0	0	0	1	0
South Dakota	2	2	5	1	11	0	------	2	2	2
Nebraska	0	0	0	0	1	0	0	0	------	--------
Kansas	0	0	0	0	0	0	0	0	0	0
South Atlantic:										
Delaware	0	0	3	1	0	0	3	1	1	0
Maryland	55	3	33	5	33	5	32	5	33	6
District of Columbia	7	2	4	2	6	3	8	2	7	4
Virginia	23	4	47	8	44	8	50	7	54	9
West Virginia	------	1	0	0	5	1	------	2	2	--------
North Carolina	27	5	34	8	21	6	32	8	27	4
South Carolina	0	0	------	1	2	0	0	0	1	0
Georgia	3	1	1	1	0	0	1	0	0	0
Florida	0	0	2	1	0	0	0	0	------	--------
East South Central:										
Kentucky	0	0	2	0	0	0	3	1	1	0
Tennessee	2	1	3	2	1	0	4	0	9	--------
Alabama	------	3	1	0	3	0	1	0	0	--------
Mississippi	0	0	0	0	0	0	0	0	0	--------
West South Central:										
Arkansas	0	0	------	1	0	0	0	0	3	--------
Louisiana	0	0	0	0	0	0	0	0	------	--------
Oklahoma	0	0	0	0	0	0	1	0	0	--------
Texas	0	0	0	0	0	0	0	1	2	1
Mountain:										
Montana	67	15	74	11	126	20	65	15	31	4
Idaho	47	10	35	9	28	9	31	11	38	7
Wyoming	118	14	93	21	95	19	47	15	72	19
Colorado	14	5	5	2	27	2	8	2	10	--------
New Mexico	0	0	0	0	0	0	0	0	2	--------
Arizona	0	0	0	0	0	0	0	0	0	--------
Utah	5	1	12	0	14	2	8	3	12	4
Nevada	15	1	5	1	5	0	10	2	8	2
Pacific:										
Washington	3	1	9	7	3	2	2	0	1	0
Oregon	50	5	58	9	40	8	34	6	48	4
California	16	1	16	1	10	2	5	1	5	--------
Total	466	76	456	96	491	89	362	87	415	72

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[1] The numbers of cases are those reported to the Public Health Service; the numbers of deaths are taken from the reports of the Bureau of the Census.

[2] Figures for 1937 are preliminary and incomplete.

Table 2 and figure 1 show the seasonal prevalence in the country as a whole and by the two geographic regions of greatest prevalence. The figures used in plotting the graphs are the average number of cases reported by months for the 5-year period 1933–37. (The data for 1937 are incomplete.)

TABLE 2.—*Cases of Rocky Mountain spotted fever reported in the South Atlantic and Mountain and Pacific States, by months, 1933 to 1937*

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
South Atlantic States:												
1933	------	------	------	------	3	27	37	23	9	1	1	------
1934	2	------	------	------	8	21	33	40	13	------	2	3
1935	2	------	1	------	8	20	32	29	11	1	1	4
1936	1	------	------	1	6	20	43	40	12	1	2	1
1937	------	1	1	------	10	26	42	29	12	1	2	1
Total	5	1	2	1	35	114	187	161	57	4	8	9
Mountain and Pacific States:												
1933	------	------	7	52	116	102	40	11	4	1	1	1
1934	2	6	29	79	120	45	13	6	2	3	------	------
1935	------	1	14	41	101	108	53	8	2	------	------	------
1936	------	------	3	33	87	62	14	7	------	1	------	2
1937	------	------	4	20	81	77	26	11	2	2	4	6
Total	2	7	57	225	505	394	146	43	10	7	5	9

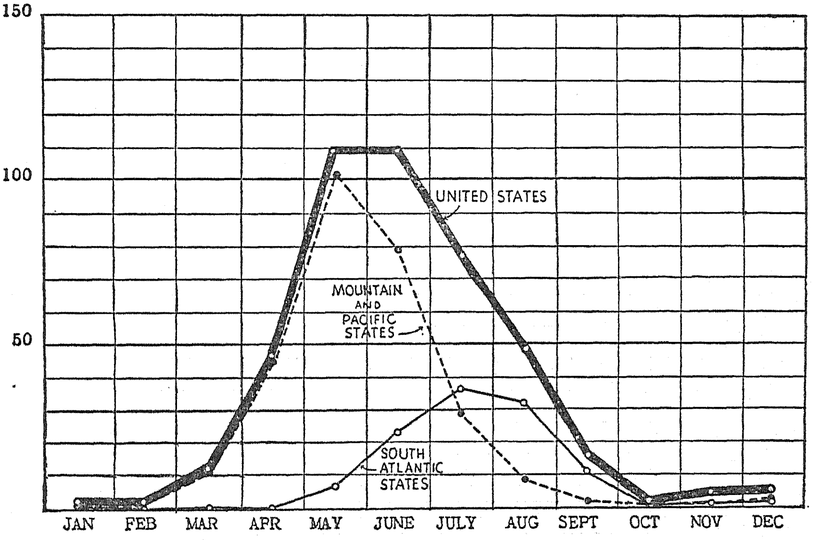

FIGURE 1.—Monthly averages of reported cases of Rocky Mountain spotted fever, 1933–37, inclusive.

The season of high incidence begins earlier and reaches its peak earlier in the western States than in the Atlantic region. In the Mountain and Pacific States the period of highest incidence begins in March, reaches the peak in May, and drops abruptly in June and July; while for the Atlantic States it apparently begins in May, reaches the peak in July, continues, though declines definitely, in August, and drops abruptly in September and October. The monthly curve for the country as a whole reflects the influence of the seasonal prevalence of the disease in the Mountain and Pacific States, where the greatest incidence occurs.

A comparison of the case fatality rates for the western and eastern groups of States, based on the total number of cases reported to the Public Health Service and the number of deaths recorded by the Bureau of the Census for the 4 years 1933–37, shows only a slight difference. The case fatality rate, that is, the number of deaths per 100 cases, for the Mountain and Pacific States over this 5-year period is 19.4, and that for the South Atlantic States is 18.1. Both of these rates may be accepted only as a minimum, as there are probably many cases unrecognized or unreported. There is, of course, no means of evaluating this factor for either region. On the other hand, the Public Health Service prophylactic vaccine has been used for many years in the western States, where the virulent type of the disease occurs; and it has been shown that this preventive measure has greatly reduced the fatality rate in that area. In earlier years, before the vaccine was developed, the case fatality rate in some areas of the Rocky Mountain region was very high; 85 or 90 persons died out of every hundred contracting the disease naturally, while the rate was even higher in those who contracted the infection in the laboratory.

TABLE 3.—*Case fatality rates of Rocky Mountain spotted fever for the South Atlantic States and the Mountain and Pacific States, 1933–36, inclusive*

	Number of cases reported	Number of deaths	Case fatality rate—deaths per 100 cases
South Atlantic States	469	86	18.1
Delaware	6	2	33.3
Maryland	153	18	11.8
District of Columbia	25	9	36.0
Virginia	164	27	16.5
West Virginia (not used)			
North Carolina	114	27	23.7
South Carolina (not used)			
Georgia	5	2	40.0
Florida	2	1	50.0
Mountain and Pacific States	1,203	233	19.4
Montana	332	61	18.4
Idaho	141	39	27.7
Wyoming	355	69	19.4
Colorado	54	11	20.4
New Mexico	0	0	0
Arizona	0	0	0
Utah	39	6	15.4
Nevada	35	4	11.4
Washington	17	10	58.8
Oregon	182	28	15.4
California	48	5	10.4

Table 3 presents the case fatality rates for the two geographical groups as a whole and for the individual States. In certain instances the rates for States are high; but the greatest significance to be attached to these high rates is probably to emphasize the need for better recognition and reporting of the disease and the fact that the value of such rates rests upon more complete reporting and the use of large numbers.

PREVENTION

Obviously the best way to avoid ticks and tick bites is to stay out of the woods and away from underbrush during the summer; but for those whose work or pleasure involves this exposure, some helpful advice may be given. Dr. R. R. Parker, of the United States Public Health Service, who has devoted a good many years of his life to the study of Rocky Mountain spotted fever, has given some practical suggestions for avoiding ticks.

Clothing should be selected which will prevent ticks from reaching and becoming attached to the skin. High boots, puttees, leggings, and socks may be worn over the trouser legs. If the ticks crawl up the outside of the clothing, they may be seen and easily removed. Those reaching the back of the neck should be removed as soon as they are felt. It is a good plan to feel the back of the neck occasionally for ticks when one is in a tick-infested region. Women who go into the woods should wear men's clothing of the kind just described. Ticks which become attached to the skin may be removed with tweezers or by the fingers and a piece of paper. At the present time there seems to be no material known that can be placed on the body or in the clothing which will repel ticks.

Rocky Mountain spotted fever is a disease for which there is no specific remedy. It is probably self-limited, and treatment is based on the symptoms. Officers of the Public Health Service have developed, and have prepared for several years, a prophylactic vaccine which offers considerable protection to persons bitten by infected ticks. This vaccine (Spencer-Parker) has been used extensively in the West and has reduced the case fatality of reported cases from 85 to 26 percent or less. Large quantities of this vaccine are prepared each year in the United States Public Health Service Rocky Mountain Laboratory at Hamilton, Mont., and many sheepherders, foresters, members of the C. C. C. camps, and others, whose work requires them to go into infested regions, receive this protective inoculation. An attack of the disease also confers a high degree of immunity. It is not known exactly how long this immunity lasts, but it is believed that no authentic case of a second attack in man has been reported, and laboratory animals have always been found to be immune after a primary infection.

So far, spotted fever has not prevailed to a sufficient extent in the Eastern States to warrant widespread use of the vaccine. However, it is comforting to know that the material can be made available in the event that an undue extension of the disease in the East should make its use desirable. As there is little that can be done in biological control of the disease by reducing the number of ticks in the woods, it behooves all persons who tramp and camp to keep ticks off the skin, as the best method of prevention is the avoidance of ticks in infested regions. However, lovers of the outdoor life may be relieved of considerable apprehension to know that only a few persons bitten by ticks develop Rocky Mountain spotted fever.

REFERENCES

Studies on Rocky Mountain spotted fever. By R. R. Spencer and R. R. Parker. Hyg. Lab. Bull. No. 154, Govt. Printing Office, Washington, D. C. 1930.

Expansion of investigations on tick-borne diseases by the United States Public Health Service. By R. R. Spencer. Pub. Health Rep., 46: 2097–2101 (1931).

Infection of the Rocky Mountain spotted fever type. Identification in the eastern part of the United States. By L. F. Badger, R. E. Dyer, and A. Rumreich. Pub. Health Rep., 46: 463–470 (1931).

Rocky Mountain spotted fever (eastern type). Transmission by the American dog tick (*Dermacentor variabilis*). By R. E. Dyer, L. F. Badger, and A. Rumreich. Pub. Health Rep., 46: 1403–1413 (1931).

The typhus-Rocky Mountain spotted fever group. An epidemiological and clinical study in the eastern and southeastern States. By A. Rumreich, R. E. Dyer, and L. F. Badger. Pub. Health Rep., 46: 470–480 (1931).

The prevention of Rocky Mountain spotted fever. Pub. Health Rep., 48: 471–473 (1933).

Rocky Mountain spotted fever and boutonneuse fever. A study of their immunological relationship. By L. F. Badger. Pub. Health Rep., 48: 507–511 (1933).

Protective value of convalescent sera of Sao Paulo exanthematic typhus against the virus of Rocky Mountain spotted fever. By R. R. Parker, and Gordon E. Davis. Pub. Health Rep., 48: 501–507 (1933).

TYPHOID FEVER CASES IN INDIANA AND OTHER STATES TRACED TO CONTAMINATED WATER SUPPLY AT ANGOLA, IND.

Contaminated drinking water from a well near Angola, Ind., used by passengers of a bus line, has been found to be responsible for at least 52 cases of typhoid fever and 6 deaths in Indiana and several other States, according to information received from the Indiana State Board of Health. Cases in patients giving a history of having stopped off at Angola for meals when enroute by bus during the early part of April have been reported from several localities in the States of Ohio, New York, and Illinois, and two cases traced to this source have been reported from California. It is quite likely that other States than those so far heard from have had recent isolated cases of typhoid fever of undetermined origin which are also attributable to this source.

The onset of the majority of the cases so far reported in persons who had used this contaminated water supply occurred in April, and it is likely that only a few cases of this origin occurred in May, as use of the supply was stopped by the local health officer in the latter part of April.

The State Board of Health reported early in May that the situation was well in hand, and that the eating place which used the contaminated well water was being inspected daily by the local health officer. In addition, frequent visits were being made by a representative of the State board of health to insure that all precautionary measures were being carried out. It has been definitely demonstrated that the well received contamination from a leaking sewer which passed near the well pit. The State and local health authorities are now making a thorough investigation to determine the specific source of the infection.

In view of the lesson to be learned from such outbreaks, Dr. Verne K. Harvey, director of the Indiana State Board of Health, suggests the following remedial measures:

1. Establishment of full-time public-health units with adequate personnel to inspect all semipublic water supplies.
2. Strengthening of the laws regarding the inspection of water supplies.
3. Regular inspection and grading of sanitation and water supplies of all restaurants and other eating places.
4. Searching inspection of all interstate bus eating places. (This step has already been taken in Indiana.)

DEATHS DURING WEEK ENDED MAY 28, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended May 28, 1938	Corresponding week, 1937
Data from 87 large cities of the United States:		
Total deaths	8,138	[1] 8,453
Average for 3 prior years	8,351	----------
Total deaths, first 21 weeks of year	182,893	203,626
Deaths under 1 year of age	494	[1] 527
Average for 3 prior years	540	----------
Deaths under 1 year of age, first 21 weeks of year	11,296	12,511
Data from industrial insurance companies:		
Policies in force	68,308,527	69,764,846
Number of death claims	12,038	13,172
Death claims per 1,000 policies in force, annual rate	9.2	9.8
Death claims per 1,000 policies, first 21 weeks of year, annual rate	9.9	11.1

[1] Data for 86 cities.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables, a zero (0) indicates a positive report and has the same significance as any other figure, while leaders (------) represent no report, with the implication that cases or deaths may have occurred but were not reported to the State health officer.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended June 4, 1938, and June 5, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended June 4, 1938	Week ended June 5, 1937	Week ended June 4, 1938	Week ended June 5, 1937	Week ended June 4, 1938	Week ended June 5, 1937	Week ended June 4, 1938	Week ended June 5, 1937
New England States:								
Maine	0	0	------	------	105	25	0	0
New Hampshire	0	0	------	------	83	157	0	0
Vermont	0	0	------	------	79	2	0	0
Massachusetts	2	3	------	------	430	647	1	3
Rhode Island	0	0	------	------	7	81	0	0
Connecticut	0	9	3	------	97	149	0	0
Middle Atlantic States:								
New York	17	35	[1] 2	[1] 6	3,408	1,653	1	11
New Jersey	7	7	5	6	724	1,741	0	1
Pennsylvania	33	21	------	------	1,846	2,058	3	8
East North Central States:								
Ohio	21	15	------	22	1,491	2,977	5	5
Indiana	25	7	6	16	442	935	0	1
Illinois	31	32	14	15	1 059	454	3	2
Michigan [2]	6	11	------	1	2,780	181	2	2
Wisconsin	3	2	27	23	2,703	98	1	0
West North Central States:								
Minnesota	4	4	------	1	375	17	0	1
Iowa	2	2	4	2	274	7	0	0
Missouri	11	15	6	30	137	71	3	1
North Dakota	0	2	6	36	67	2	1	0
South Dakota	1	0	------	------	------	4	1	0
Nebraska	4	0	------	------	252	27	1	0
Kansas	3	3	------	3	383	19	0	1
South Atlantic States:								
Delaware	0	0	------	------	7	37	0	1
Maryland [2,3]	1	5	2	2	16	259	0	3
District of Columbia	6	4	2	1	44	110	2	4
Virginia [3]	5	8	------	------	607	379	1	12
West Virginia	4	7	27	11	339	59	3	3
North Carolina [4]	7	12	1	1	948	309	1	5
South Carolina [4]	2	2	77	63	128	64	2	1
Georgia [4]	3	0	------	------	153	------	0	0
Florida	7	10	1	3	44	------	2	1

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended June 4, 1938, and June 5, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended June 4, 1938	Week ended June 5, 1937	Week ended June 4, 1938	Week ended June 5, 1937	Week ended June 4, 1938	Week ended June 5, 1937	Week ended June 4, 1938	Week ended June 5, 1937
East South Central States:								
Kentucky	10	10	3	8	126	475	3	5
Tennessee	1	3	18	20	104	120	3	5
Alabama [4]	6	11	9	27	176	33	5	8
Mississippi [2]	3	2					1	0
West South Central States:								
Arkansas	3	3	8	12	180	3	0	0
Louisiana	4	8	4	9	27	9	0	0
Oklahoma	9	6	25	6	171	48	0	1
Texas [4]	35	36	181	156	176	389	0	5
Mountain States:								
Montana [3]	1	0			90	3	1	0
Idaho [3]	1	0		4	7	25	0	2
Wyoming [3] [5]	1	0			16	5	0	0
Colorado [5]	18	1			178	23	1	1
New Mexico	1	1		1	16	52	0	0
Arizona	2	1	21	21	16	33	0	0
Utah [4] [3]	0	0			344	80	0	0
Pacific States:								
Washington	0	10			20	40	1	0
Oregon [3]	2	0	27	8	54	4	1	0
California [4]	37	21	11	50	624	305	2	3
Total	339	332	490	570	21,443	14.169	51	96
First 22 weeks of year	11,032	10,330	41,924	271,027	682,231	191,060	1,690	3,428

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended June 4, 1938	Week ended June 5, 1937	Week ended June 4, 1938	Week ended June 5, 1937	Week ended June 4, 1938	Week ended June 5, 1937	Week ended June 4, 1938	Week ended June 5, 1937	Week ended June 4, 1938
New England States:									
Maine	0	0	8	22	0	0	1	2	22
New Hampshire	0	0	22	32	0	0	0	0	
Vermont	1	0	9	6	0	0	2	0	20
Massachusetts	0	1	328	217	0	0	1	1	143
Rhode Island	0	0	26	45	0	0	0	1	24
Connecticut	0	0	73	107	0	0	0	2	76
Middle Atlantic States:									
New York	0	4	519	566	0	0	1	8	433
New Jersey	0	0	97	131	0	0	1	2	191
Pennsylvania	0	0	202	434	0	0	9	6	184
East North Central States:									
Ohio	0	2	182	508	69	2	8	3	133
Indiana	0	0	75	137	39	30	3	1	30
Illinois	0	0	320	401	15	22	5	8	230
Michigan [2]	0	1	271	418	1	2	6	5	257
Wisconsin	2	0	144	207	2	2	3	3	191
West North Central States:									
Minnesota	0	0	78	117	16	26	1	0	45
Iowa	0	0	64	107	21	22	1	0	34
Missouri	0	1	154	196	48	30	8	9	38
North Dakota	0	0	33	23	19	21	2	0	25
South Dakota	0	0	4	24	22	2	0	0	3
Nebraska	0	2	14	54	1	4	0	0	14
Kansas	0	0	57	87	23	13	1	3	134
South Atlantic States:									
Delaware	0	0	3	2	0	0	1	0	9
Maryland [2] [3]	0	0	48	20	0	0	5	7	47
District of Columbia	0	0	11	3	0	0	1	2	12
Virginia [3]	0	0	23	10	0	0	6	7	147
West Virginia	1	0	16	56	1	1	5	3	104
North Carolina [4]	2	0	13	20	6	1	8	3	240

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended June 4, 1938, and June 5, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended June 4, 1938	Week ended June 5, 1937	Week ended June 4, 1938	Week ended June 5, 1937	Week ended June 4, 1938	Week ended June 5, 1937	Week ended June 4, 1938	Week ended June 5, 1937	Week ended June 4, 1938
South Atlantic States—Con.									
South Carolina [4]	0	1	5	5	0	0	8	12	69
Georgia [4]	0	1	2	6	0	0	21	6	44
Florida	3	0	1	0	0	0	9	1	20
East South Central States:									
Kentucky	1	2	13	35	2	0	4	8	43
Tennessee	2	0	31	15	1	0	9	4	66
Alabama [4]	1	0	6	4	0	0	13	2	26
Mississippi [2]	0	9	2	1	1	0	6	2	--------
West South Central States:									
Arkansas	1	1	1	6	13	0	16	10	41
Louisiana	2	1	2	15	1	0	11	16	10
Oklahoma	0	0	21	19	32	8	11	7	60
Texas [4]	0	3	70	84	34	5	34	24	378
Mountain States:									
Montana [3]	0	0	12	12	5	15	1	0	43
Idaho [3]	0	0	6	10	5	1	1	3	5
Wyoming [3] [5]	0	0	7	10	0	3	0	2	10
Colorado [5]	1	0	37	30	4	3	7	0	21
New Mexico	0	0	9	14	0	0	0	3	12
Arizona	0	0	5	13	9	0	3	0	24
Utah [2] [3]	0	0	14	8	0	0	0	0	80
Pacific States:									
Washington	0	0	15	29	22	1	1	1	113
Oregon [3]	0	1	19	29	28	20	3	4	38
California [3]	2	6	155	175	18	8	7	11	421
Total	19	36	3,315	4,470	458	242	244	192	4,305
First 22 weeks of year	427	468	120,897	145,153	10,804	6,750	2,966	2,606	94,258

[1] New York City only.

[2] Period ended earlier than Saturday.

[3] Rocky Mountain spotted fever, week ended June 4, 1938, 20 cases as follows: Maryland, 2; Virginia, 3; Montana, 1; Idaho, 2; Wyoming, 6; Utah, 1; Oregon, 2; California, 3.

[4] Typhus fever, week ended June 4, 1938, 33 cases as follows: North Carolina, 1; South Carolina, 7; Georgia, 10; Alabama, 6; Texas, 9.

[5] Colorado tick fever, week ended June 4, 1938, 6 cases as follows: Wyoming, 1; Colorado, 5.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Piliomyelitis	Scarlet fever	Smallpox	Typhoid fever
April 1938										
Alaska	0	0	118	--------	1	--------	0	0	0	1
Colorado	6	42	119	--------	1,579	--------	2	202	15	6
Massachusetts	7	16	--------	2	1,438	--------	0	1,639	0	2
May 1938										
Arkansas	1	24	107	268	883	84	2	17	20	26
Connecticut	1	26	11	--------	235	--------	0	440	0	6
Delaware	0	7	--------	--------	59	--------	0	31	0	1
Iowa	1	11	8	--------	1,300	--------	3	435	121	10
North Carolina	5	45	57	47	7,127	125	3	72	10	32

Summary of monthly reports from States—Continued

April 1938

	Cases
Chickenpox:	
Alaska	13
Colorado	348
Massachusetts	1,300
Colorado tick fever:	
Colorado	1
Dysentery:	
Alaska (bacillary)	4
Colorado (amoebic)	2
Massachusetts (bacillary)	14
Encephalitis, epidemic or lethargic:	
Colorado	1
Massachusetts	1
German measles:	
Massachusetts	104
Impetigo contagiosa:	
Alaska	1
Lead poisoning:	
Massachusetts	1
Mumps:	
Alaska	64
Colorado	58
Massachusetts	1,107
Ophthalmia neonatorum:	
Massachusetts	84
Paratyphoid fever:	
Massachusetts	6
Rabies in animals:	
Massachusetts	5
Rocky Mountain spotted fever:	
Colorado	1
Septic sore throat:	
Alaska	3
Colorado	16
Massachusetts	28
Tetanus:	
Massachusetts	3
Trachoma:	
Alaska	1
Trichinosis:	
Massachusetts	4
Undulant fever:	
Colorado	3
Massachusetts	2
Whooping cough:	
Alaska	1
Colorado	150
Massachusetts	421

May 1938

	Cases
Chickenpox:	
Arkansas	52
Connecticut	465
Delaware	69
Iowa	284
North Carolina	316
Conjunctivitis, infectious:	
Connecticut	6
Dysentery:	
Arkansas (amoebic)	1
Arkansas (bacillary)	44
Connecticut (bacillary)	2
Encephalitis, epidemic or lethargic:	
Arkansas	3
Iowa	1
German measles:	
Connecticut	54
Delaware	1
Iowa	4
North Carolina	26
Mumps:	
Arkansas	32
Connecticut	787
Delaware	74
Iowa	129
Ophthalmia neonatorum:	
Connecticut	1
North Carolina	2
Paratyphoid fever:	
Arkansas	1
Connecticut	2
Rabies in animals:	
Arkansas	31
Connecticut	6
Rocky Mountain spotted fever:	
Delaware	1
North Carolina	2
Septic sore throat:	
Arkansas	13
Connecticut	18
Iowa	5
North Carolina	7
Tetanus:	
Arkansas	1
Connecticut	1
Trachoma:	
Arkansas	16
Trichinosis:	
Connecticut	4
Tularaemia:	
Arkansas	7
North Carolina	2
Typhus fever:	
Connecticut	1
North Carolina	3
Undulant fever:	
Arkansas	6
Connecticut	13
Iowa	6
North Carolina	2
Vincent's infection:	
North Carolina	3
Whooping cough:	
Arkansas	147
Connecticut	497
Delaware	38
Iowa	154
North Carolina	1,602

PLAGUE INFECTION FOUND IN FLEAS IN SANTA CRUZ COUNTY, CALIF.

Under date of May 11, 1938, Dr. W. M. Dickie, Director of Public Health of California, reported that plague infection had been proved in 18 fleas collected at the mouth of a squirrel burrow in Santa Cruz County, Calif.

PLAGUE INFECTION IN GROUND SQUIRREL AND IN FLEAS, LOUSE, AND TICK FROM GROUND SQUIRRELS IN GRANT COUNTY, OREG.

Under date of June 1, 1938, Senior Surgeon C. R. Eskey, reported plague infection proved in Grant County, Oreg., as follows:

In tissue from 1 ground squirrel (*Citellus oregonus*) shot May 21, 1 to 3 miles south of Mount Vernon, Grant County, Oregon.

In 26 fleas, 1 louse, and 1 tick collected from 41 ground squirrels (*Citellus oregonus*) shot May 21, 1 to 4 miles south of Mount Vernon, Grant County, Oreg.

PLAGUE INFECTION IN GROUND SQUIRREL IN BANNOCK COUNTY, IDAHO

Under date of June 4, 1938, Past Asst. Surg. V. H. Haas reported plague infection had been proved in tissue from 1 ground squirrel (*Citellus armatus*) shot May 25, 1938, 16 miles north of Lava Hot Springs, Bannock County, Idaho.

WEEKLY REPORTS FROM CITIES

City reports for week ended May 28, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	166	89	34	5,884	569	2,006	16	417	32	1,348	-------
Current week [1]	104	36	19	5,728	439	1,404	21	352	39	1,346	-------
Maine:											
Portland	0	------	0	14	2	0	0	0	0	5	23
New Hampshire:											
Concord	0	------	0	0	0	0	0	0	0	0	14
Manchester	0	------	0	0	1	4	0	0	0	0	24
Nashua	0	------	0	0	0	2	0	0	0	0	6
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	1
Burlington	0	------	0	7	0	1	0	0	0	0	9
Rutland	0	------	0	0	1	0	0	0	0	0	8
Massachusetts:											
Boston	2	------	1	230	25	109	0	8	0	26	198
Fall River	0	------	0	0	3	1	0	2	0	0	35
Springfield	0	------	0	30	2	0	0	0	0	11	27
Worcester	0	------	0	1	4	23	0	2	0	10	50
Rhode Island:											
Pawtucket	0	------	0	0	2	2	0	0	0	0	27
Providence	0	------	0	0	8	10	0	1	0	12	55
Connecticut:											
Bridgeport	0	1	0	2	0	2	0	0	1	0	29
Hartford	0	------	2	4	3	14	0	1	0	2	42
New Haven	0	------	0	9	3	2	0	0	2	16	42
New York:											
Buffalo	0	------	0	6	7	48	0	4	0	3	142
New York	21	2	3	1,889	89	241	0	85	5	200	1,412
Rochester	0	1	0	21	4	22	0	3	0	3	77
Syracuse	0	------	0	67	3	7	0	2	0	4	51
New Jersey:											
Camden	0	------	0	4	4	7	0	0	0	2	27
Newark	0	1	0	14	6	11	0	7	0	50	114
Trenton	0	------	1	0	4	9	0	2	1	3	36
Pennsylvania:											
Philadelphia	3	------	1	432	21	102	0	22	5	36	492
Pittsburgh	6	------	0	26	12	27	0	7	0	27	148
Reading	0	------	0	24	1	0	0	1	0	0	24
Scranton	0	------	-------	6	-------	5	0	-------	0	2	-------
Ohio:											
Cincinnati	5	------	0	7	6	8	0	4	1	3	116
Cleveland	1	11	0	219	13	31	0	10	0	64	169
Columbus	0	------	0	19	5	5	0	1	0	2	73
Toledo	1	2	1	98	1	4	0	6	0	12	73
Indiana:											
Anderson	1	------	0	17	0	0	0	0	0	0	7
Fort Wayne	1	------	0	7	1	10	0	0	1	0	22
Indianapolis	1	------	0	119	11	12	0	1	0	3	101
Muncie	0	------	0	0	0	0	0	0	0	0	7
South Bend	0	------	0	53	0	0	2	0	0	2	15
Terre Haute	0	------	0	2	0	1	1	0	0	0	15
Illinois:											
Alton	0	------	0	0	1	1	0	0	0	0	10
Chicago	17	2	0	192	24	198	3	33	1	76	631
Elgin	0	------	0	0	1	2	0	0	0	0	9
Moline	0	------	0	2	0	1	0	0	0	1	7
Springfield	0	------	0	2	0	3	1	0	0	0	24
Michigan:											
Detroit	3	------	1	229	10	132	0	18	0	149	234
Flint	0	------	0	106	7	22	0	0	0	3	31
Grand Rapids	0	------	0	215	4	17	0	0	0	2	35
Wisconsin:											
Kenosha	0	------	0	131	0	2	0	0	0	2	6
Madison	0	------	0	409	0	5	0	0	0	2	14
Milwaukee	0	------	0	33	5	33	0	4	1	55	110
Racine	1	------	0	147	0	7	0	0	0	11	8
Superior	0	------	0	4	0	1	0	0	0	0	7

[1] Figures for St. Paul, Minn., and Raleigh, N. C., estimated: reports not received.

City reports for week ended May 28, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0	------	0	13	1	0	0	1	0	1	28
Minneapolis	0	------	0	246	4	14	6	1	0	8	110
St. Paul	------	------	------	------	------	------	------	------	------	------	------
Iowa:											
Cedar Rapids	0	------	------	10	------	2	0	------	0	1	------
Davenport	0	------	------	0	------	1	0	------	0	0	------
Des Moines	0	------	0	46	0	23	0	0	0	1	35
Sioux City	0	------	------	52	------	2	0	------	0	6	------
Waterloo	0	------	------	13	------	4	0	------	0	1	------
Missouri:											
Kansas City	1	------	0	4	2	10	0	5	1	0	89
St. Joseph	0	------	0	3	2	1	0	0	0	0	24
St. Louis	1	------	0	4	5	40	0	11	0	6	247
North Dakota:											
Fargo	0	------	0	1	1	0	0	1	0	3	5
Grand Forks	0	------	------	21	------	2	0	------	0	1	------
Minot	0	------	0	1	0	0	0	0	0	1	5
South Dakota:											
Aberdeen	0	------	------	0	------	4	0	------	0	11	------
Nebraska:											
Lincoln	1	------	------	33	------	5	0	------	0	4	------
Omaha	0	------	0	236	7	1	0	2	0	1	62
Kansas:											
Lawrence	0	------	0	37	0	0	0	0	0	3	5
Topeka	0	------	0	74	1	0	0	0	0	42	4
Wichita	0	------	0	29	2	1	0	1	0	9	33
Delaware:											
Wilmington	1	------	0	3	1	2	0	0	1	6	23
Maryland:											
Baltimore	4	1	1	31	9	53	0	7	1	46	190
Cumberland	0	------	0	8	0	0	0	0	0	0	10
Frederick	0	------	0	0	0	0	0	0	0	0	3
Dist. of Col.:											
Washington	11	------	0	19	11	15	0	10	4	9	153
Virginia:											
Lynchburg	0	------	0	0	1	1	0	0	0	3	14
Norfolk	0	1	0	49	0	3	0	2	0	3	25
Richmond	0	------	0	147	7	1	0	0	0	0	49
Roanoke	1	------	0	3	0	3	0	0	1	1	14
West Virginia:											
Charleston	0	------	0	0	2	0	0	1	0	2	12
Huntington	0	------	------	0	------	0	0	------	0	0	------
Wheeling	0	------	0	20	0	2	0	0	0	2	17
North Carolina:											
Gastonia	0	------	------	16	------	0	0	------	0	0	------
Raleigh	------	------	------	------	------	------	------	------	------	------	------
Wilmington	0	------	0	11	0	0	0	1	0	12	9
Winston-Salem	0	------	0	38	1	0	0	3	0	31	16
South Carolina:											
Charleston	1	------	0	0	3	0	0	2	0	0	28
Florence	0	------	0	15	0	0	0	0	0	0	10
Greenville	0	------	0	11	2	0	0	2	0	7	11
Georgia:											
Atlanta	0	4	1	6	5	6	0	5	0	18	91
Brunswick	0	------	0	16	2	0	0	0	0	0	4
Savannah	0	1	0	9	0	0	0	2	1	5	31
Florida:											
Miami	0	------	0	5	4	0	0	2	0	2	35
Tampa	2	------	0	12	2	0	0	1	1	0	28
Kentucky:											
Ashland	0	------	------	0	------	0	0	0	0	0	------
Covington	0	------	0	0	1	0	0	0	0	4	11
Lexington	0	------	0	1	0	0	0	0	0	0	21
Louisville	4	------	0	63	4	3	0	3	0	8	64
Tennessee:											
Knoxville	0	1	0	24	4	4	0	1	0	8	32
Memphis	0	------	0	2	6	3	0	7	0	6	80
Nashville	0	------	1	27	4	3	0	2	1	15	50
Alabama:											
Birmingham	0	2	0	16	0	4	0	4	1	3	62
Mobile	0	------	1	0	1	0	0	2	0	0	35
Montgomery	1	------	------	19	------	0	0	------	0	1	------
Arkansas:											
Fort Smith	0	------	------	3	------	0	0	------	2	0	------
Little Rock	0		0	0	4	0	0	1	0	0	------

City reports for week ended May 28, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	------	0	0	0	0	0	0	0	0	5
New Orleans	3	1	1	3	11	4	1	9	2	0	136
Shreveport	0	------	0	1	3	0	0	3	1	0	38
Oklahoma:											
Muskogee	0	------	------	0	------	0	0	------	0	0	------
Oklahoma City	0	------	0	3	2	1	0	2	2	0	36
Tulsa	0	------	------	156	------	1	0	------	0	15	------
Texas:											
Dallas	1	2	2	4	2	10	0	4	0	10	57
Fort Worth	0	------	0	0	1	0	1	2	0	13	81
Galveston	0	------	0	0	1	0	0	0	0	1	7
Houston	3	------	1	2	2	3	5	6	2	0	62
San Antonio	0	------	0	1	4	2	0	0	2	1	79
Montana:											
Billings	0	------	0	0	1	0	0	0	0	0	7
Great Falls	0	------	0	0	4	2	0	0	0	17	10
Helena	0	------	0	1	0	0	0	0	0	1	1
Missoula	0	------	0	0	1	0	0	0	0	1	11
Idaho:											
Boise	0	------	0	0	0	2	1	1	1	1	8
Colorado:											
Colorado Springs	0	------	0	3	1	0	1	2	0	2	16
Denver	3	------	0	37	5	14	0	5	0	5	74
Pueblo	1	------	0	33	0	2	0	0	1	1	13
New Mexico:											
Albuquerque	0	------	0	2	1	1	0	3	0	0	12
Utah:											
Salt Lake City	1	------	1	242	0	7	0	0	0	8	48
Washington:											
Seattle	0	------	1	1	2	0	0	3	0	74	110
Spokane	0	------	0	0	2	0	0	1	0	19	49
Tacoma	0	------	0	0	2	5	0	0	0	5	36
Oregon:											
Portland	0	1	0	20	4	15	1	0	0	2	103
Salem	0	3	------	3	------	1	0	------	0	0	------
California:											
Los Angeles	8	5	0	53	10	43	1	19	0	26	285
Sacramento	0	------	0	32	1	3	0	4	0	24	35
San Francisco	1	2	0	5	8	14	0	18	0	72	155

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
New York:			
Buffalo	1	2	0
New York	1	0	0
Pennsylvania:			
Philadelphia	2	0	0
Ohio:			
Cleveland	1	0	0
Michigan:			
Detroit	2	0	0
District of Columbia:			
Washington	0	1	0
Alabama:			
Birmingham	2	0	0
Montgomery	0	0	2
Louisiana:			
New Orleans	0	0	4
Shreveport	0	2	0
New Mexico:			
Albuquerque	0	1	0
Washington:			
Spokane	1	0	0
Oregon:			
Portland	1	0	0
California:			
San Francisco	1	0	0

Encephalitis, epidemic or lethargic.—Cases: New York, 2; Trenton, 1; Baltimore, 1; Birmingham, 1; Los Angeles, 1; San Francisco, 1.

Pellagra.—Cases: Winston-Salem, 1; Atlanta, 3; Birmingham, 3; New Orleans, 1.

Typhus fever.—Cases: Savannah, 1; Houston, 1.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—2 weeks ended May 21, 1938.—During the 2 weeks ended May 21, 1938, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia[1]	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	--------	--------	--------	6	--------	--------	--------	2	--------	8
Chickenpox	--------	9	8	189	435	162	59	18	179	1,059
Diphtheria	--------	2	2	62	6	5	5	1	1	84
Dysentery	--------	--------	--------	1	2	--------	--------	--------	--------	3
Erysipelas	--------	--------	--------	16	2	7	--------	3	2	30
Influenza	--------	--------	--------	2	41	15	--------	--------	7	65
Lethargic encephalitis	--------	--------	--------	--------	1	--------	--------	--------	--------	1
Measles	--------	39	2	251	934	23	25	46	17	1,337
Mumps	--------	6	2	--------	258	158	4	17	12	457
Paratyphoid fever	--------	1	--------	--------	--------	--------	--------	2	1	4
Pneumonia	--------	2	--------	--------	50	--------	--------	--------	13	65
Poliomyelitis	--------	--------	--------	2	1	1	1	--------	--------	5
Scarlet fever	--------	30	11	133	143	45	73	64	47	546
Trachoma	--------	--------	--------	--------	--------	1	--------	--------	1	2
Tuberculosis	3	8	50	150	83	28	48	5	28	403
Typhoid fever	--------	2	4	31	1	8	1	3	--------	50
Undulant fever	--------	--------	--------	--------	1	--------	--------	--------	--------	1
Whooping cough	--------	17	--------	70	156	47	--------	12	122	424

[1] For 2 weeks ended May 25, 1938

FINLAND

Communicable diseases—April 1938.—During the month of April 1938, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	189	Poliomyelitis	9
Dysentery	1	Scarlet fever	1,082
Influenza	21,629	Typhoid fever	41
Lethargic encephalitis	3	Undulant fever	3
Paratyphoid fever	10		

FRANCE

Vital statistics—Year 1937—Comparative.—Following are vital statistics for France for the years 1937 and 1936:

	1937	1936
Number of marriages	274, 122	279, 743
Number of live births	616, 863	630, 059
Number of stillbirths	23, 006	23, 603
Total deaths	628, 603	642, 139
Deaths under 1 year of age	40, 084	42, 213

SCOTLAND

Vital statistics—Quarter ended March 31, 1938.—Following are vital statistics for Scotland for the quarter ended March 31, 1938:

	Number	Rate per 1,000 population		Number	Rate per 1,000 population
Population	4, 985, 300	----------	Deaths from—Continued.		
Number of marriages	7, 891	6. 4	Influenza	164	0. 13
Births	22, 237	18. 1	Measles	280	. 24
Deaths	17, 449	14. 2	Pneumonia	1, 341	1. 09
Deaths under 1 year of age	1, 790	[1] 80	Scarlet fever	39	. 03
Deaths from:			Tuberculosis	947	. 77
Cerebrospinal fever	35	. 03	Whooping cough	42	. 03
Diphtheria	141	. 11			

[1] Per 1,000 live births.

Vital statistics—Year 1937.—Following are provisional vital statistics for Scotland for the year 1937:

	Number	Rate per 1,000 population		Number	Rate per 1,000 population
Population	4, 970, 500	----------	Deaths from—Continued.		
Marriages	38, 345	7. 7	Heart disease	14, 358	----------
Births	87, 812	17. 6	Influenza	2, 693	----------
Deaths	68, 942	13. 9	Measles	119	----------
Deaths under 1 year of age	7, 050	[1] 80			
Maternal mortality	----------	[1] 4. 8	Nephritis, acute and chronic	1, 886	----------
Deaths from:			Pneumonia (all forms)	4, 858	----------
Appendicitis	451	----------	Puerperal sepsis	144	----------
Cancer	7, 811	----------	Scarlet fever	123	----------
Cerebral hemorrhage	6, 411	----------	Suicide	452	----------
Cerebrospinal fever	144	----------	Tuberculosis	3, 663	----------
Cirrhosis of the liver	196	----------			
Diabetes mellitus	867	----------	Typhoid fever and paratyphoid fever	16	----------
Diarrhea (all ages)	1, 073	----------	Whooping cough	717	----------
Diphtheria	426	----------			

[1] Per 1,000 live births.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for May 27, 1938, pages 880–893. A similar cumulative table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Cholera

China.—During the week ended May 28, 1938, cholera was reported in China as follows: Hong Kong, 2 cases; Shanghai, 18 cases; Swatow, 4 cases.

Plague

Peru.—During the month of April 1938, 2 cases of plague were reported in Libertad Department, and 1 case, with 1 death, in Lima Department, Peru.

United States.—Reports of plague infection in fleas in Santa Cruz County, Calif., in a ground squirrel in Bannock County, Idaho, and in a ground squirrel and ground squirrel parasites in Grant County, Oreg., appear on page 995 of this issue of the PUBLIC HEALTH REPORTS.

Smallpox

Iraq—Baghdad.—During the week ended May 28, 1938, 1 case of smallpox was reported in Baghdad, Iraq.

Honduras—Tela.—During the week ended May 28, 1938, 1 case of smallpox was reported in Tela, Honduras.

Yellow Fever

Nigeria.—On May 27, 1938, 1 case of yellow fever was reported in Igbaja, and 1 case in Iragbiyin, Nigeria.

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UNITED STATES TREASURY DEPARTMENT

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IN THIS ISSUE

Prevalence of Poliomyelitis in the United States Since 1916
Analysis of Data on Tooth Mortality Found in School Children
A Study of Pseudotuberculosis Rodentium Recovered From a Rat

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THOMAS PARRAN, *Surgeon General*

DIVISION OF SANITARY REPORTS AND STATISTICS

Asst. Surg. Gen. ROBERT OLESEN, *Chief of Division*

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It contains (1) current information regarding the prevalence and geographic distribution of communicable diseases in the United States insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

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PUBLIC HEALTH REPORTS

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STUDIES ON THE EPIDEMIOLOGY OF POLIOMYELITIS

By C. C. DAUER, M. D., *Epidemiologist, District of Columbia Health Department*

Part I

To paraphrase a recent statement on science in general, the aim of epidemiology is to find out and expose, as far as is humanly possible, why diseases are as they are, and to learn the rules under which they act. Studies on the epidemiology of poliomyelitis have resulted in numerous hypotheses which have been altered by obtaining and studying additional data.

The purpose of this section of the paper is to present certain information on the prevalence of poliomyelitis in the United States since 1916, and to review the epidemiology of the disease as it was presented in 1916 and its developments during the succeeding 20 years. The year 1916 was selected as the starting point of this study because the epidemic of that year was intensively studied and reported upon, and the history of the disease previous to that time has been adequately reviewed. The second part of the paper presents in detail the distribution of the disease by counties during the 5-year period from 1933 to 1937, inclusive.

Death rates rather than case rates are used in this section of the paper to show the prevalence of poliomyelitis in the various States because they probably are more nearly accurate. A study of case fatality rates disclosed the fact that there were wide fluctuations from year to year in some States, suggesting that cases were well reported in epidemic years and poorly reported in the intervals between epidemics. In other States case fatality rates fluctuated within fairly definite limits, which might be regarded as an indication of fairly uniform reporting of cases. The decline in case fatality rates in the past 10 to 15 years might be explained on the basis of more complete reporting of cases, the inclusion of more abortive and nonparalytic cases among those reported, of a difference in the virulence of the virus, a more resistant host, or by a combination of two or more of the factors mentioned.

The death rates presented in table 1 are based on data taken from Mortality Statistics Reports of the Bureau of the Census. The data shown in figure 1 are from the same source.

GEOGRAPHICAL DISTRIBUTION

The epidemic of 1916, the most severe in the history of poliomyelitis in the United States, was most intense in New York and New Jersey. It extended into New England, where it was less severe, into the East North Central States, and as far south along the Atlantic coast as North Carolina. Montana also experienced a sharp outbreak in 1916. From 1917 to 1920, localized outbreaks occurred in a few scattered States located in different sections of the country. Judging by the death rates, the disease became more prevalent again in 1921, at which time outbreaks occurred in the New England, Middle Atlantic, East North Central, and West North Central States. The State of Washington in that year experienced the most severe outbreak of poliomyelitis, but none of the neighboring States had an unusual number of deaths from this cause. In 1924 and 1925 several of the Pacific Coast and Rocky Mountain States had outbreaks of the disease.

In 1927 and 1928 death rates from poliomyelitis were higher than average in most parts of the country. In the Middle Atlantic States death rates were below the average for these 2 years, and no outbreaks occurred in the South Atlantic States south of North Carolina, in the East South Central States except for Kentucky, nor in the West South Central States.

Most of the Rocky Mountain and Pacific Coast States experienced high death rates from the disease in 1930. A widespread outbreak occurred in the northeastern section of the country again in 1931. The New England and Middle Atlantic States were most severely affected. Outbreaks of less intensity occurred in several of the East North Central and West North Central States.

In 1932 and 1933 a few localized outbreaks occurred in various sections of the country. In 1934 a severe outbreak of poliomyelitis occurred in the extreme northwestern part of the country. The States of Washington, Idaho, and Montana were most severely affected. In California and Arizona the disease was also epidemic.

In 1935, localized outbreaks occurred in Virginia, North Carolina, and Kentucky, and in several of the New England States. In 1936 an epidemic broke out in the West South Central States. The outbreaks which occurred in the South Atlantic and East South Central States in 1935 and 1936 have been described in more or less detail in various reports, and their geographical distribution will be presented in detail in the second part of this paper.

The mortality data for the year 1937 are not yet available for the various states. Other data show a widespread outbreak of poliomyelitis in the West South Central, West North Central, and several of the Rocky Mountain States.

TABLE 1.—Poliomyelitis death rates per 100,000 population, by States, 1915–36

Division and State	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936
New England States:																						
Maine	0.8	3.7	0.6	0.9	0.3	1.2	2.2	0.8	0.0	1.7	1.3	0.9	2.8	1.0	0.8	3.5	1.3	0.9	0.8	0.6	1.7	0.4
New Hampshire	2.0	5.7	2.0	1.8	.7	2.5	.4	1.3	.2	2.6	1.1	.1	2.8	1.7	.9	2.4	2.1	.4	1.2	0	2.2	.2
Vermont	5.0	3.4	4.2	.3	0	.9	2.8	1.4	.5	1.4	3.7	1.1	1.1	2.5	.8	.8	2.8	0	1.3	0	1.9	0
Massachusetts	1.1	12.7	1.3	1.0	.4	3.9	1.2	.9	.9	.6	1.1	1.1	4.1	1.6	.5	.8	2.7	.3	.7	.3	1.4	.3
Rhode Island	1.2	7.4	1.2	.8	.2	0	.5	2.4	.5	.9	1.5	1.1	1.7	.6	.1	.1	1.4	.4	.1	0	3.4	.1
Connecticut	1.0	18.7	1.3	.7	.6	1.2	1.7	1.1	.6	1.5	1.2	.3	1.0	.9	.4	.9	5.9	.5	.2	.2	1.5	.4
Middle Atlantic States:																						
New York	.7	34.1	1.1	.8	.5	.6	2.5	1.5	1.1	1.7	1.8	1.2	1.1	1.9	.9	1.0	5.3	.5	1.1	.3	1.1	.2
New Jersey	.8	41.5	1.4	.5	.5	.6	1.5	.9	1.2	.7	.9	.4	1.1	.7	.3	.4	3.4	1.1	.5	.3	.8	.2
Pennsylvania	1.0	8.1	1.7	1.2	.6	.6	.9	.4	.7	.5	.7	.5	1.1	.8	.5	.5	.9	1.5	.5	.3	.3	.2
East North Central States:																						
Ohio	1.9	2.4	2.0	1.2	.7	.8	1.4	.5	.4	.7	1.1	.8	2.6	1.1	.5	1.6	.7	.4	.8	.5	.5	.8
Indiana	.7	1.8	1.1	.8	1.0	.5	1.3	.7	.8	.7	.9	.5	1.4	.6	.4	1.0	.5	2	.2	.6	.3	.5
Illinois	------	------	------	1.8	1.2	.9	2.3	.8	.7	.4	.6	.4	1.5	.5	.3	.9	1.3	.5	.3	3	.5	1.0
Michigan	1.2	4.5	1.2	1.5	2.3	.9	3.0	.6	.8	2.8	.7	.7	1.5	.7	1.0	.8	2.4	.5	.1	.6	.9	.5
Wisconsin	.5	2.6	1.0	3.7	1.9	.7	2.6	.9	.6	1.0	2.2	.5	1.4	.5	.5	.9	1.6	.4	.5	.6	.2	.2
West North Central States:																						
Minnesota	1.3	4.7	.8	1.4	.7	.7	3.9	.8	.6	1.1	5.6	.5	1.2	2.3	.2	1.5	2.6	.4	1.5	.8	.5	.2
Iowa	------	------	------	------	------	------	------	------	.9	.6	1.7	.5	1.1	.6	.9	1.3	1.6	7	.6	.4	.3	.5
Missouri	1.2	1.4	1.4	.9	1.1	.9	1.7	.6	.8	.5	1.5	.5	2.2	.7	.4	1.1	.7	.3	.4	.4	.4	.6
North Dakota	------	------	------	------	------	------	------	------	------	2.7	6.3	.7	1.8	2.5	1.3	1.4	1.2	.4	1.3	.6	.4	.4
South Dakota	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	1.6	1.9	1.2	.6	1.4	.9	.1
Nebraska	------	------	------	------	------	.8	2.2	.4	1.9	.6	3.0	1.3	1.6	.6	.7	3.2	.9	.7	.4	.6	.8	.8
Kansas	1.1	1.4	1.0	.6	1.1	.5	2.0	.7	1.6	.5	1.9	.7	2.3	.4	.4	3.5	.7	.6	.6	.6	.5	.5
South Atlantic States:																						
Delaware	------	------	------	------	1.3	0	0	0	1.3	1.3	.4	0	.9	3.0	1.2	0	.8	.8	.4	0	.4	.4
Maryland	1.6	8.0	1.2	1.2	2.6	.9	2.5	.9	.4	1.3	1.1	.8	.4	1.7	.2	.4	.6	.4	.2	.4	.3	.2
District of Columbia	1.1	1.6	.5	0	0	.5	1.5	0	.2	.2	.8	1.0	1.1	1.0	.7	.8	.6	1.1	.4	.5	1.9	.3
Virginia	1.7	3.1	3.0	1.4	1.7	1.0	1.2	1.0	1.1	1.1	1.2	1.1	1.4	1.3	1.5	.9	.8	.7	.4	.7	1.9	.5
West Virginia	------	------	------	------	------	------	------	------	------	------	.9	.5	2.6	2.4	1.0	.6	1.3	.8	1.1	1.1	.7	1.1
North Carolina	------	2.0	1.4	.8	.7	.8	1.0	.7	.9	.9	.9	1.8	.6	.9	.7	.6	1.1	.7	.5	.5	2.1	.5
South Carolina	------	1.8	1.0	1.1	1.1	.7	1.0	.9	.9	.5	2.2	1.1	1.5	1.1	.9	.9	.8	.7	.8	.4	.7	.9
Georgia	------	------	------	------	------	------	------	1.0	1.4	.9	------	------	------	.7	.6	.9	1.0	.9	.3	1.0	.6	1.1
Florida	------	------	------	------	.6	6	.3	.7	.6	.3	1.5	.9	.6	.6	.5	.9	.5	.4	.4	.2	.4	.4
East South Central States:																						
Kentucky	1.0	2.1	1.7	2.2	.9	.8	.9	1.2	.9	1.3	1.7	1.4	2.8	1.5	1.0	1.1	1.0	1.5	1.0	1.4	1.6	1.2
Tennessee	------	------	1.2	1.4	.8	.8	1.2	.9	1.1	.9	1.6	1.1	1.5	1.5	1.3	1.1	.8	.7	1.2	1.2	1.0	1.5
Alabama	------	------	------	------	------	------	------	------	------	------	1.0	.8	1.1	.9	1.0	.8	.9	.3	.4	.5	.5	1.5
Mississippi	------	------	------	------	1.1	.9	.9	.8	.7	.9	1.3	1.4	1.0	1.1	.9	.7	.7	1.2	.5	1.0	.5	1.0
West South Central States:																						
Arkansas	------	------	------	------	------	------	------	------	------	------	------	------	1.7	.9	.8	1.3	1.4	.8	.6	.3	.4	.9
Louisiana	------	------	------	.7	.6	.8	.3	.6	.9	.6	.9	.8	1.6	.7	.5	2.3	.8	.5	.5	.2	.6	.4
Oklahoma	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	.8	.8	1.1	.8	.4	1.4
Texas	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	.8	1.2	.8	.6

TABLE 1.—*Poliomyelitis death rates per 100,000 population, by States, 1915–36*—Continued

Division and State	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1920	1930	1931	1932	1933	1934	1935	1936
Mountain States:																						
Montana	0 2	5.0	1.6	1.3	0.6	0.9	0.4	1.3	1.1	4.2	1.1	0 9	0 .7	1.8	0	1.1	2.8	0.7	0.4	2.6	0.2	0.9
Idaho	------	------	------	------	------	------	------	1.6	.9	1.1	1.1	0	1.8	2.5	1.3	1.3	.7	.9	.9	3.0	.6	1.2
Wyoming	------	------	------	------	------	------	------	------	.5	.4	0	.4	.4	0	1.8	0	1.3	0	0	.9	.9	.4
Colorado	.6	.5	.3	.9	.9	.6	.8	.5	.3	.7	.8	.8	1.4	2.7	.6	1.6	.2	1.0	.4	.4	1.1	1.4
New Mexico	------	------	------	------	------	------	------	------	------	------	------	------	------	------	1.4	3.1	1.1	2.1	.2	1.4	.9	1.7
Arizona	------	------	------	------	------	------	------	------	------	------	------	1.0	6.1	3.1	.9	3.4	1.4	1.4	1.0	4.2	2.0	1.2
Utah	.7	.7	.2	.5	.7	.2	1.1	.9	.2	.2	0	1.0	4.5	1.6	.6	.2	1.2	.8	.6	.6	.2	.2
Nevada	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	0	1.1	1.0	1.0	0	0
Pacific States:																						
Washington	.5	.9	.5	.5	.7	.3	8.8	.6	.8	7.2	2.3	.5	4.3	3.6	.7	.7	1.0	.7	1.0	3.3	.4	1.0
Oregon	------	------	------	.3	.2	.6	------	.2	.5	1.2	.2	.3	9 3	4.0	1.4	.8	.8	.3	1.0	.8	1.6	.9
California	.8	.9	.7	.6	.3	.8	1.5	.7	1.0	.8	3.3	.8	4 6	1.4	.8	2.7	.9	.6	.2	1.8	1.1	.6

From 1916 to 1937, inclusive, outbreaks of poliomyelitis have shown two characteristics. In 1916, 1921, 1927–28, 1931, 1934, and 1937 they were widespread and affected fairly large areas. In the intervals between these widespread outbreaks, localized epidemics occurred in more or less restricted regions. In adjacent areas to these localized epidemics the disease appears to have been no more than endemic in character.

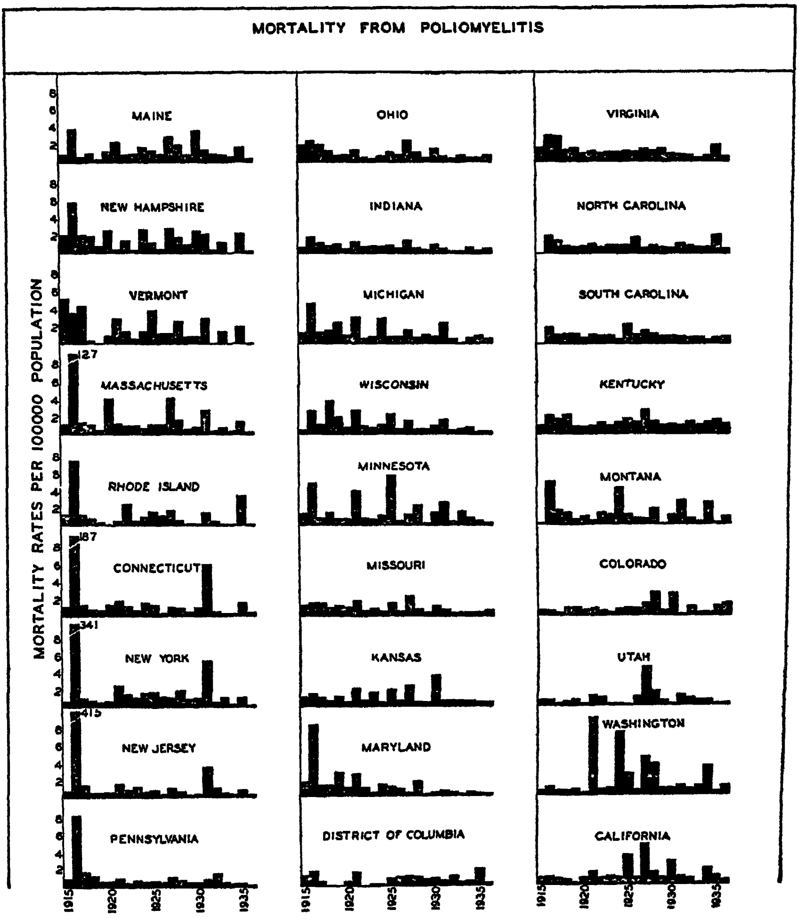

FIGURE 1.—Poliomyelitis death rates per 100,000 population for certain States, 1915 to 1936.

The widespread outbreaks since 1915 have occurred at varying intervals from 3 to 5 years. The same geographical area is not always affected in successive outbreaks. In 1916 the epidemic was most intense in the Middle Atlantic and New England States; in 1921 the East North Central and West North Central States were most severely affected. In 1927 and 1928 the outbreak was most severe in the Rocky Mountain and Pacific Coast States. In 1931 the greatest intensity was again found in the Middle Atlantic and New England States. The widespread outbreak in 1934 occurred in the Rocky Mountain and Pacific Coast States, and in 1937 in the West North Central and West South Central States. The localized epidemics in the intervening years showed even more irregularities as regards geographical distribution and intensity.

Although death rates are not available for the 48 States from 1916 to 1936, inclusive, the available data clearly indicate that the disease occurs in every section of the country each year either in endemic or epidemic form. Judging from the available data for southern States, poliomyelitis seldom broke out in epidemics in this region previous to 1935. In the past 3 years, 1935, 1936, and 1937, as will be shown in the later section of this paper, there has been a definite increase in outbreaks in the South.

The most definite change in the occurrence of poliomyelitis since 1916 has been in the age distribution of persons affected. In 1916 and previous to that time, from two-thirds to three-fourths of the cases reported were in children under 5 years of age, while one-fifth or less were in persons 10 years of age and over. Since 1930, from one-third to one-half of reported cases have been in children less than 5 years of age, and one-fourth to one-third in persons 10 or more years of age. This change has been a gradual one over the past 20 years. In large cities there is still to be found a greater proportion of cases in children under 5 years than in rural regions, but the shift in the age distribution is apparent.

Except for this change in age distribution, there seems to have been little change in the behavior of the disease in recent years. Any reduction in case fatality rates could be explained by more complete reporting of cases; better diagnostic facilities, a more complete knowledge of the disease, and the development of public health activities no doubt have led to better reporting.

EPIDEMIOLOGY OF POLIOMYELITIS

One may summarize as follows the prevailing views concerning the epidemiology of poliomyelitis twenty years ago:[1]

1. The generally accepted view was that poliomyelitis was caused by a filterable virus and could be transmitted to monkeys experimentally. Aside from man and certain monkeys, no other animals were known to be susceptible. Nasal and intestinal secretions of persons suffering with the disease usually contained the virus. It was believed that carriers were responsible for widespread infection.

2. Monkeys could be infected with the virus by injecting it into the brain and nerve sheaths, and by introducing it into the nasal mucous

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[1] Epidemiologic Studies of Poliomyelitis in New York City and the Northeastern United States During the Year 1916. By C. H. Lavinder, A. W. Freeman, and W. H. Frost. Public Health Bulletin No. 91.

membrane. It had also been reported that monkeys had been infected by biting insects but this method of experimental infection was open to question.

3. The disease was widespread and widely scattered, but it occurred most frequently in localized outbreaks which were irregular and scattered. It was noted that epidemics usually were more intense in villages and rural areas than in densely populated cities. The relatively small proportion of the population contracting the disease during an epidemic in contrast to other epidemic diseases was noted.

4. Although the characteristic seasonal prevalence was recognized, it was known that outbreaks of poliomyelitis occasionally began in the spring or extended into the fall months. Isolated outbreaks were known to occur in the winter time. Even though it was the general belief that secretions from the upper respiratory tract were infectious, it had not escaped the attention of observers that poliomyelitis had a seasonal prevalence very different from all other acute respiratory diseases.

5. The preponderance of cases in children under 5 years of age was noted, and also the fact that there was a greater concentration of cases under 5 years in cities than in rural areas.

6. Poliomyelitis was generally regarded as a contagious disease mainly spread from one human being to another. It was observed in some outbreaks that the infection apparently spread from case to case only in a small proportion of instances. No direct or indirect association could be traced in the majority of cases even after the most careful and searching investigations. However, it was observed that a greater proportion of contact children in families affected with poliomyelitis developed the disease than the child population as a whole. It was generally believed that an immunity or resistance to infection developed in a large proportion of persons following exposure to infection and that carriers were instrumental in spreading the infectious agent from one susceptible individual to another. The occurrence of abortive cases and of subclinical infections was also suggested.

7. The widespread occurrence of poliomyelitis and the apparent, although not proved, spread from case to case in a few instances suggested that man was the only source of infection and that lower animals were not the reservoir of infection. The possibility of a lower animal being the primary source of the disease was recognized, but investigations failed to show any positive evidence of such a source. The possibility that the disease might be spread by an insect vector was also recognized, but no convincing epidemiological evidence of such transmission was revealed. A few instances of insect transmission to monkeys had been reported, but these experimental results had not been confirmed.

Following the 1916 outbreak, the opinion most generally held seemed to be that poliomyelitis was a contagious disease and that man was the only source of infection. This view is the one which is most generally accepted at the present time. It is quite evident, however, that no one in 1916 had any definite information regarding the mode of transmission of the disease; and the question of the mode of transmission is still unanswered.

From time to time attempts have been made to explain why only certain individuals develop poliomyelitis on exposure to infection. Draper suggested that morphological characteristics in certain persons were determining factors in the development of the disease. His views have never been widely accepted, nor have subsequent investigations substantiated his theories. Aycock has suggested that variations in physiological activities of the body determine whether or not a person will develop poliomyelitis. These variations, according to Aycock, are the result of environmental influences, principally seasonal. It has also been suggested that persons belonging to certain blood groups are more susceptible to poliomyelitis than others. Inheritance factors, vitamin imbalance, and other hypotheses have also been mentioned.

In recent years the possibility of the existence of several immunologically distinct strains of poliomyelitis virus has been brought to light. Not only is the possibility of different strains of virus admitted, but the ability of various strains to produce the disease experimentally by different routes or portals of entry is also suggested. These possibilities are important in studying the epidemiology of the disease.

It is quite evident that little has been added to our knowledge of the epidemiology of poliomyelitis in the past 20 years. More studies have been conducted in the experimental laboratory than in the field. It appears that the final solution of the epidemiological problems of poliomyelitis will have to come from studies of the behavior of the disease as it occurs under varying conditions from year to year. These studies will have to be conducted in such a manner that all possible factors which may be concerned in the causation of the disease will be brought to light.

Part II

In the preceding section the prevalence of poliomyelitis since 1916 in the United States was discussed and certain aspects of the epidemiology of the disease were reviewed. This section presents in detail the distribution of poliomyelitis by counties in the 5-year period 1933–37, inclusive, for the entire country. A number of papers have described and discussed certain of the outbreaks which have occurred since 1932, and, of these, Lumsden's recent paper presents the geographical distribution of the disease in greatest detail.[2] Other phases of the epidemiology of poliomyelitis are discussed in considerable detail by Lumsden, and should be read by everyone interested in this problem.

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[2] Lumsden, L. L.: Poliomyelitis: Facts and fallacies Southern Medical Journal, May 1938.

The number of cases by counties was secured from records of or through the cooperation of the United States Public Health Service. Case rates rather than death rates are used in this part of the study because the former are more readily available and probably are more significant for the present purpose. It is recognized that reporting of cases may vary in periods of low prevalence as compared with epidemic periods, and that the proportion of abortive and nonparalytic cases may also vary. However, it appears that such differences do not seriously interfere with the main purpose of this presentation.

TABLE 2.—*Poliomyelitis case rates per 100,000 population, by States, 1933–37*

Division and State	1933	1934	1935	1936	1937
New England States:					
Maine	8.1	2.7	19.0	5.0	16.1
New Hampshire	2.8	.8	9.5	.8	4.9
Vermont	13.7	1.6	17.7	2.1	7.6
Massachusetts	8.2	1.7	32.0	1.3	7.9
Rhode Island	3.0	.1	51.5	.7	3.2
Connecticut	4.8	.8	23.4	.9	6.2
Middle Atlantic States:					
New York	3.2	1.7	22.2	1.5	4.9
New Jersey	5.5	1.4	11.8	.6	3.6
Pennsylvania	4.1	1.4	2.2	1.3	3.3
East North Central States:					
Ohio	5.3	4.3	1.3	5.1	7.9
Indiana	1.3	1.9	1.4	1.5	4.2
Illinois	2.6	4.8	3.0	8.8	9.9
Michigan	1.9	4.9	13.0	3.2	9.0
Wisconsin	2.2	4.7	2.2	1.5	11.4
West North Central States:					
Minnesota	14.4	4.0	3.6	1.2	12.6
Iowa	1.7	1.5	2.5	3.0	9.4
Missouri	1.0	.9	1.3	2.7	9.9
North Dakota	11.8	1.4	1.7	2.7	.9
South Dakota	5.3	6.3	2.1	1.9	5.7
Nebraska	1.9	1.5	.9	1.7	16.0
Kansas	2.9	4.3	1.9	5.0	12.9
South Atlantic States:					
Delaware	2.8	1.2	2.0	.4	3.1
Maryland	2.6	1.5	6.4	2.2	4.8
District of Columbia	2.2	2.0	14.3	1.1	4.8
Virginia	1.5	3.0	25.7	2.2	2.4
West Virginia	5.2	4.7	2.2	3.4	3.7
North Carolina	.9	1.4	19.8	1.5	3.1
South Carolina	1.6	1.9	2.1	1.2	1.2
Georgia	1.4	.8	.8	4.8	2.7
Florida	.5	1.0	1.0	2.5	1.8
East South Central States:					
Kentucky	1.6	4.2	11.5	3.1	4.4
Tennessee	4.3	2.2	3.2	13.2	4.4
Alabama	1.0	1.8	2.1	14.6	2.9
Mississippi	.7	1.7	.8	9.5	21.0
West South Central States:					
Arkansas	.4	.4	.8	2.7	16.2
Louisiana	1.4	1.2	4.8	1.6	6.2
Oklahoma	1.2	.6	.5	5.0	18.1
Texas	.8	2.5	1.3	1.1	10.7
Mountain States:					
Montana	2.4	60.3	1.1	2.6	5.8
Idaho	1.8	33.0	.9	4.3	3.9
Wyoming	4.8	3.5	.9	3.0	16.7
Colorado	.6	1.9	2.1	6.3	19.4
New Mexico	2.1	4.2	2.4	7.4	6.1
Arizona	7.5	32.0	6.1	3.4	6.8
Utah	4.4	2.9	2.1	1.3	6.4
Nevada	2.1	16.3	2.0	2.0	5.0
Pacific States:					
Washington	5.6	45.8	2.4	4.7	5.3
Oregon	3.6	8.1	4.6	3.6	6.0
California	2.9	56.6	13.7	6.4	11.5
Registration area	4.3	5.9	8.6	3.5	7.3

Case rates by counties are shown on the maps for each of the 5 years from 1933 to 1937, and case rates by States are shown in table 2.

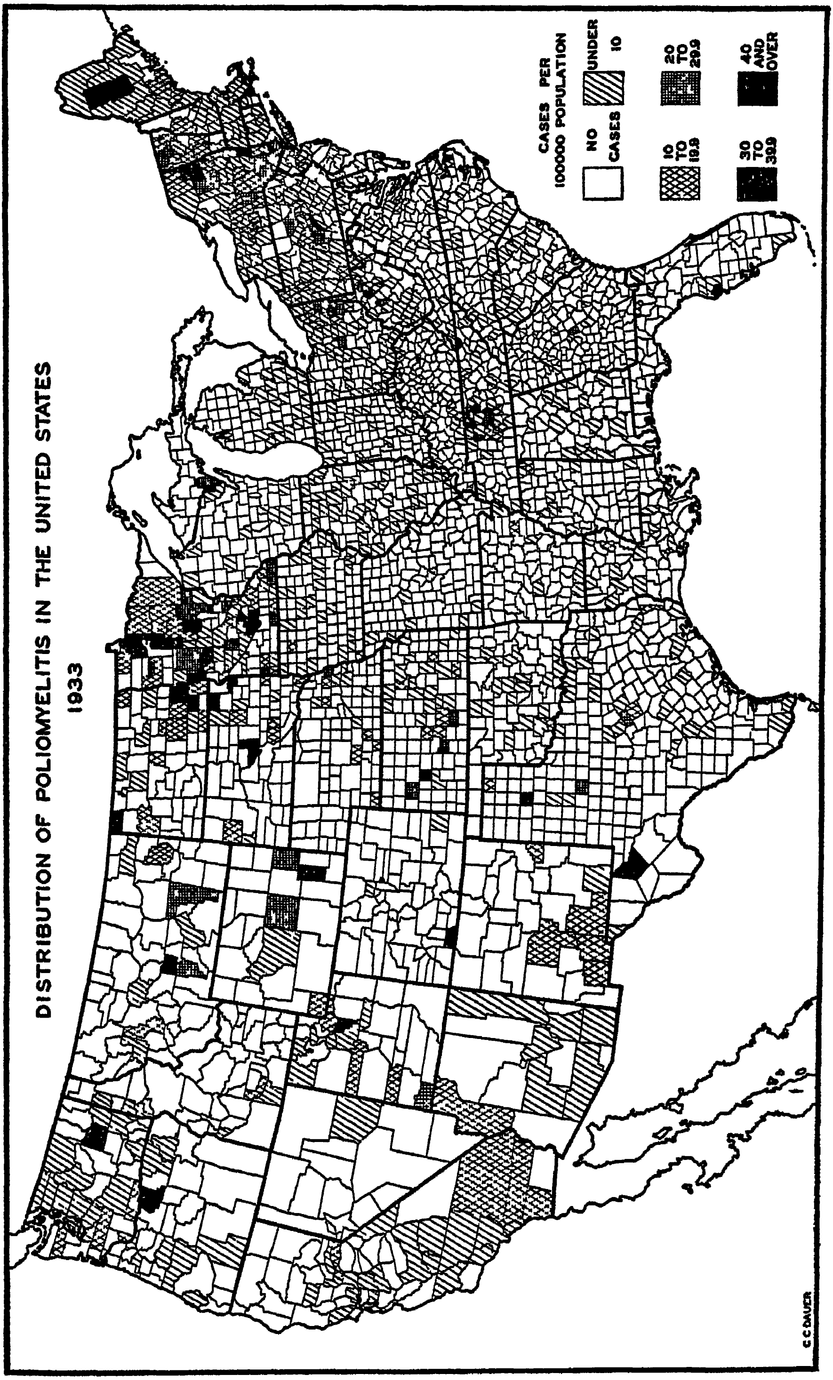
1933.—In the country as a whole, the incidence of poliomyelitis was comparatively low in 1933. (See table 2 and map 1.) The incidence was comparatively high in only one area—an area including most of Minnesota and the eastern half of North Dakota and South Dakota. Several localized outbreaks of milder intensity occurred in central Tennessee and Kentucky, in southeastern Ohio and northern West Virginia, in central Pennsylvania, in southeastern New York, and in northern New York, northern Vermont, and central Maine. In the greater part of southern California and the southern parts of Arizona and New Mexico the incidence was slightly above average for the year. In other States very small localized outbreaks occurred, as evidenced by scattered counties with case rates of 30 or more per 100,000.

1934.—An extensive outbreak of poliomyelitis occurred in the western part of the United States in 1934. As shown in map 2, the outbreak was extensive and intensive in a large area extending from central Washington through northern Idaho, and to the eastern part of Montana. In a group of counties in central Idaho, and another in western Oregon and western Washington, the incidence of the disease was lower, but above the average for the country as a whole. A moderately severe outbreak occurred in a group of counties in north central California, and a more severe one in south central California. The greater part of Arizona was also the seat of a severe epidemic.

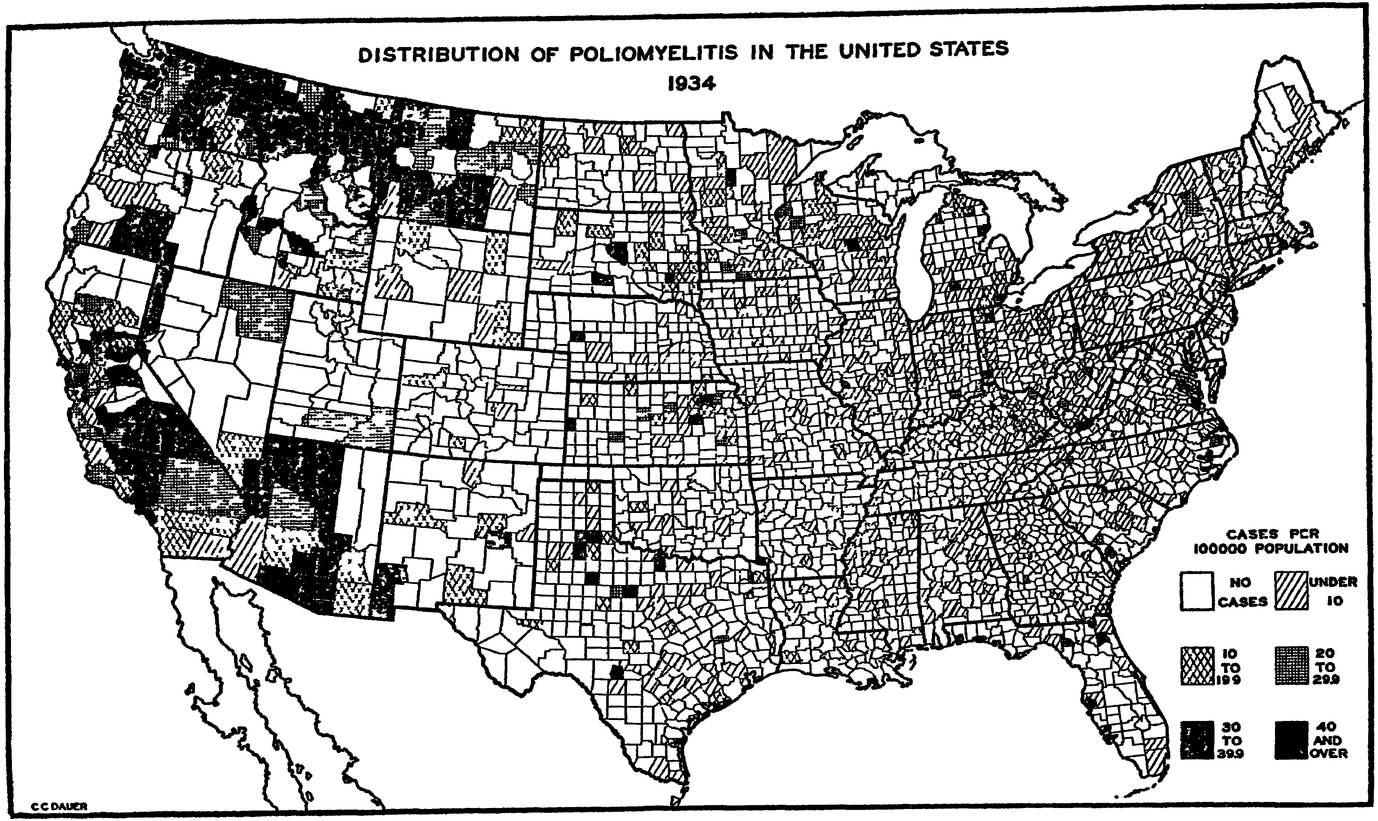
The remainder of the country had a fairly low incidence of poliomyelitis except the northwestern part of Texas, where a few scattered counties had a high incidence of the disease.

1935.—A number of outbreaks of poliomyelitis occurred in 1935. In southwestern Oregon and the extreme northern part of California, where the incidence was fairly low in 1934, an outbreak occurred. The disease was prevalent again in south central California but less severe than during the preceding year. The incidence was high in a number of counties in western Kentucky, and also in Michigan. An epidemic of unusual proportions occurred in two adjacent groups of counties in the east central section of North Carolina and Virginia. In smaller groups of counties in New York and in New England, poliomyelitis also occurred in epidemic proportions.

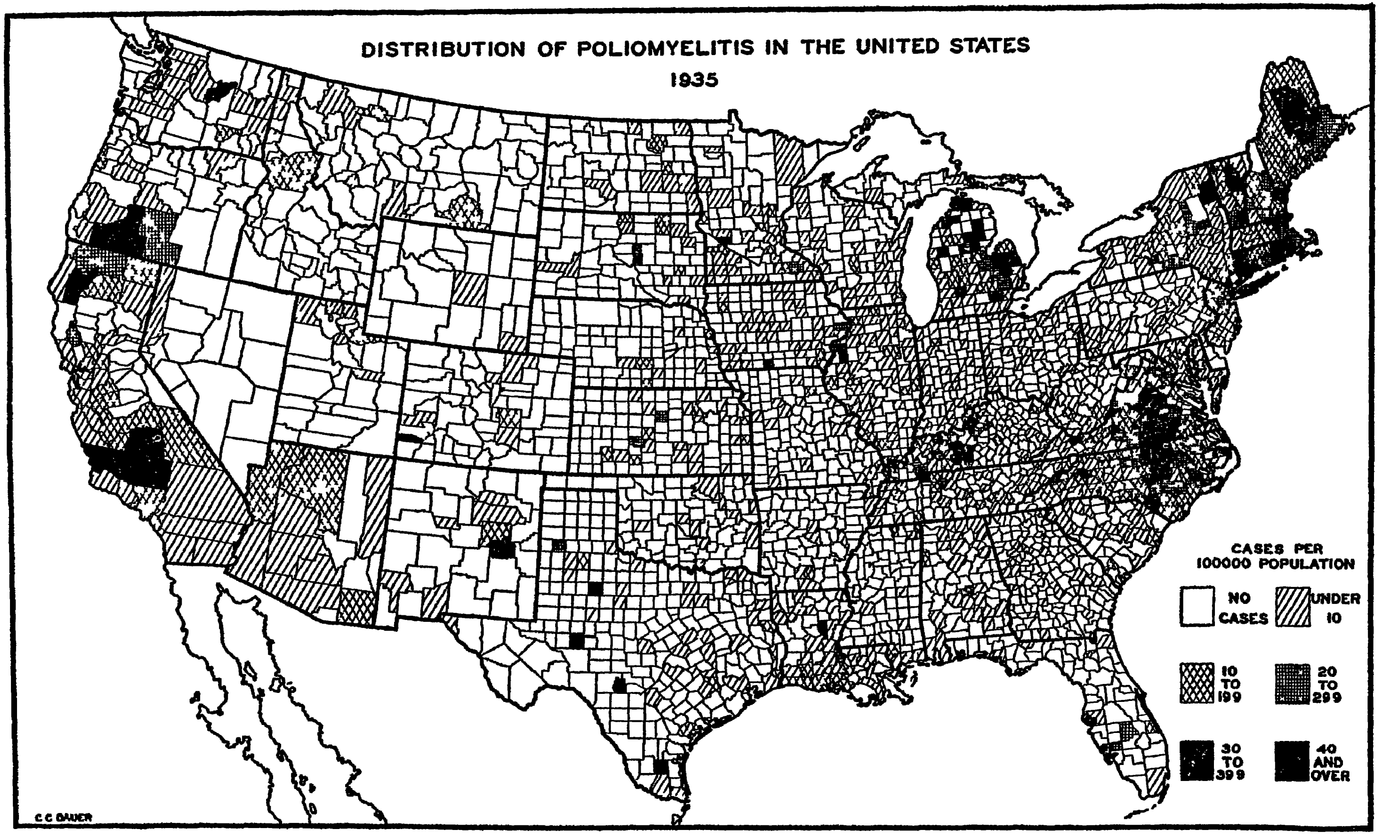
1936.—A number of small localized outbreaks occurred in various sections of the country during 1936. The most extensive epidemic occurred in an area comprising the northwestern part of Alabama, northeastern Mississippi, west central Tennessee, the extreme western part of Kentucky, and extending in varying degrees from the southern to the northern border of Illinois. The epidemic was most intense in Alabama, Mississippi, and Tennessee. A small outbreak occurred in a tri-State area consisting of a few counties in northern Virginia,


DISTRIBUTION OF POLIOMYELITIS IN THE UNITED STATES
1933
CASES PER 100000 POPULATION
NO CASES
UNDER 10
10 TO 19.9
20 TO 29.9
30 TO 39.9
40 AND OVER
G C DAUER

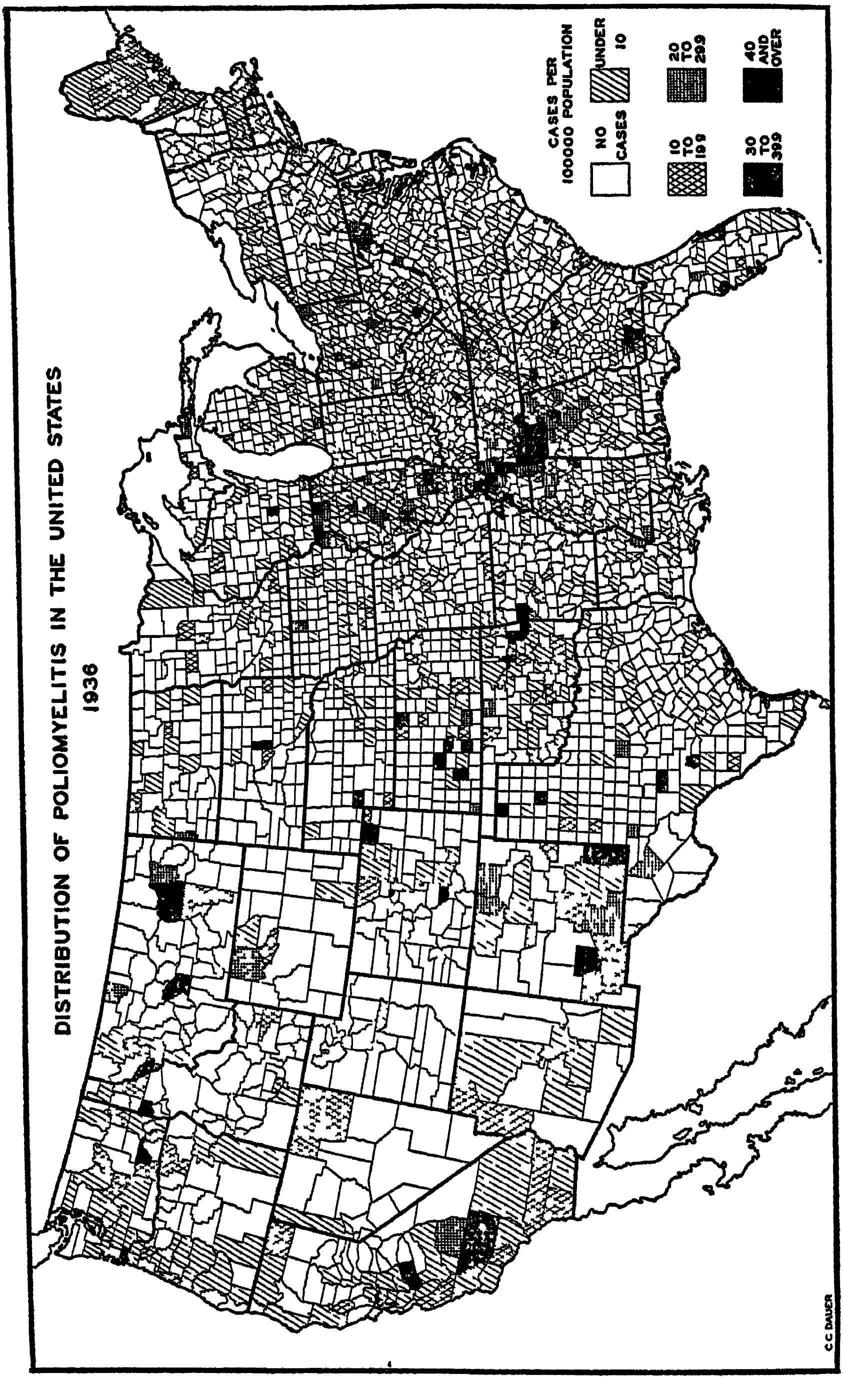
MAP 1.—Poliomyelitis case rates per 100,000 population, by counties, in the United States, 1933.


DISTRIBUTION OF POLIOMYELITIS IN THE UNITED STATES
1934
CASES PER 100000 POPULATION
NO CASES
UNDER 10
10 TO 19.9
20 TO 29.9
30 TO 39.9
40 AND OVER
C C DAUER

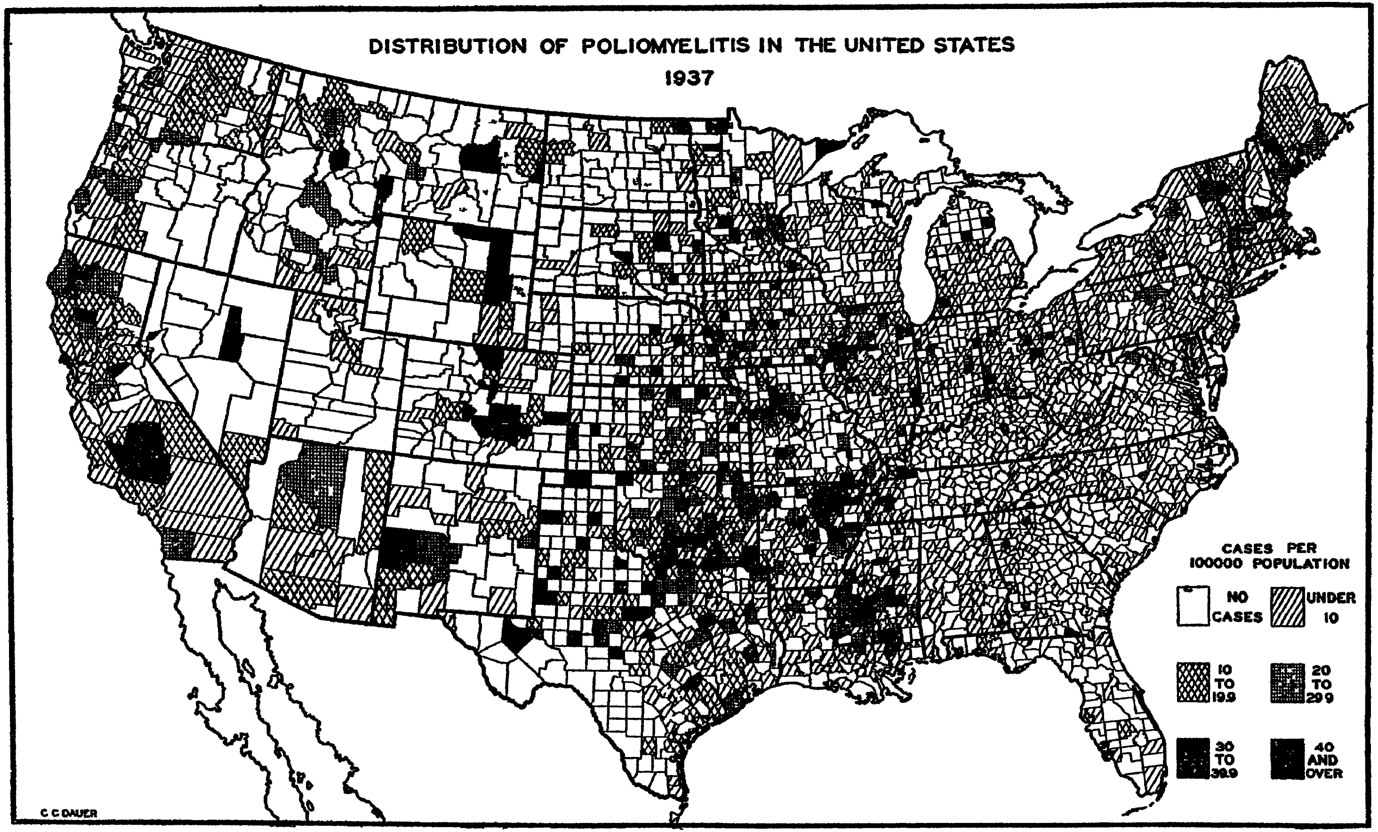
MAP 2.—Poliomyelitis case rates per 100,000 population, by counties, in the United States, 1934.


DISTRIBUTION OF POLIOMYELITIS IN THE UNITED STATES
1935
CASES PER 100000 POPULATION
NO CASES
UNDER 10
10 TO 19.9
20 TO 29.9
30 TO 39.9
40 AND OVER
C.C. BAUER

Map 8 —Poliomyelitis case rates per 100,000 population, by counties, in the United States, 1935



MAP 4.—Poliomyelitis case rates per 100,000 population, by counties, in the United States, 1936.


DISTRIBUTION OF POLIOMYELITIS IN THE UNITED STATES
1937
CASES PER 100000 POPULATION
NO CASES
UNDER 10
10 TO 19.9
20 TO 29.9
30 TO 39.9
40 AND OVER
C C DAUER

MAP 5.—Poliomyelitis case rates per 100,000 population, by counties, in the United States, 1937 eastern West Virginia, and western Maryland. Others occurred in southern Georgia, in western Arkansas and eastern Oklahoma, in central Kansas, and in southern New Mexico. These areas, except for the one in Georgia, were not severely affected.

1937.—As shown in Map 5, the central part of the country from the Gulf of Mexico to the Canadian border was involved in a wide-spread epidemic. In groups of counties in southwestern Mississippi, northeastern Arkansas, and two adjacent groups in south central Oklahoma and north central Texas, the incidence was very high. Groups of counties in Colorado and Wyoming also experienced severe outbreaks. In the remainder of the area the case rates were somewhat lower but well above average in a large number of counties. A severe outbreak also occurred in the Province of Ontario, Canada, in the late summer of 1937, but there is no evidence of any association between it and the epidemic in the central part of the United States.

A few scattered areas in New England, California, and the extreme northwestern part of the country also experienced moderately severe localized outbreaks.

DISCUSSION

The irregularity of distribution which has characterized epidemics of poliomyelitis in the past has been exhibited in outbreaks occurring since 1932. Certain of them were confined to small groups of counties where the incidence was very high in some instances and only moderately so in others. Widespread epidemics also showed varying degrees of intensity in the different parts of the epidemic area.

There are fairly accurate accounts of some outbreaks of poliomyelitis in which the initial or first cases have been found or located in a particular area. In some instances it has seemed that the disease has spread from a definite area in a radial fashion, and principally in one direction in others. The direction or directions in which the disease has spread cannot be determined in all the outbreaks shown on the maps used in this paper, but it appears that some of them have spread principally in one direction. The outbreaks occurring in North Carolina and Virginia in 1935, and the one involving Alabama, Mississippi, Tennessee, Kentucky, and Illinois in 1936 are examples of this type of spread. A study of the number of cases reported by months in these States shows that the disease was first reported in large numbers in the State farthest south, and later in those to the north. The earlier seasonal occurrence in Southern, as compared with the Northern States, seems to influence the general direction of spread of poliomyelitis in outbreaks.

In some outbreaks of poliomyelitis in which only a few counties have been involved, the spread of disease has seemed to have been very definitely limited. Numerous examples of this may be found on the maps presented with this paper.

There have been a number of statements in the literature regarding the tendency of poliomyelitis to spread along lines of human traffic. However, there is no evidence of such manner of spread to be found in the data used here. Geographical barriers, such as mountains, valleys, and large rivers, do not seem to have influenced the direction in which the disease spreads.

It has been stated frequently that poliomyelitis outbreaks have been more intense in small towns and rural regions than in large cities. On the maps presented here it can be seen that case rates are lower during outbreaks for counties in which large cities (250,000 or more population) are located than in the surrounding, less thickly populated counties. It is also apparent that, during inter-epidemic periods, case rates are slightly higher in the counties with large cities than in rural areas. Cases occur each year in each of the large cities, but frequently none occur in rural areas between outbreaks.

High case rates (30 or more per 100,000 population) for 2 or more successive years occurred infrequently in a single county or groups of counties from 1933 to 1937. However, the occurrence of high case rates in one group of counties of a State or region during 1 year and in another group within the same State or in the same general region in a succeeding year was not infrequent. In some instances high rates for 2 successive years occurred in single counties with small populations, in which case the existence of one or two cases naturally resulted in high case rates. Under such circumstances one cannot eliminate the element of chance. Two adjacent counties in California had high case rates during 4 of the 5 years from 1933 to 1937, but this is said to be due to the fact that an unusual number of "abortive" cases have been reported even in the years when the disease had not seemed to be epidemic in adjacent counties.

Case rates by States do not always give a true picture of the prevalence of poliomyelitis within certain States, and this is more likely to be true in States with large populations. For instance, Pennsylvania and Tennessee did not have high case rates in 1933, nor Michigan in 1934, nor Georgia in 1936 (see table 2). However, localized epidemics occurred within these States during the respective years mentioned. In these instances the increased numbers of cases due to the localized outbreaks were not sufficiently large to cause more than a moderate rise in the case rates for the States as a whole. On the other hand, the case rates in the North Central States in 1937 were fairly high, but there was no evidence of localized or general epidemics within any State except in northwestern Illinois, where a group of counties had rates only moderately high, between 20 and 30 per 100,000 population.

CONCLUSION

The distribution of poliomyelitis in the United States from 1933 to 1937, inclusive, was extremely irregular in several respects. The regions involved in outbreaks of the disease showed wide variations in extent. In some outbreaks only a few counties were involved, and in other outbreaks there were a large number. The severity of the disease as evidenced by case rates showed considerable variation from year to year and from place to place.

The data presented in this paper confirm the statement that the disease is found in all parts of the country.

In this, as well as in the preceding section of this paper, the aim has been to present only factual material. No attempt has been made to explain any of the facts presented. This cannot be done because of many unsolved problems in the epidemiology of poliomyelitis. The solution of these problems awaits more intensive and extensive studies of the disease in the laboratory and, most important of all, in the field.

ACKNOWLEDGMENTS

The author wishes to thank all who aided in collection of the data used in this paper, especially Assistant Surgeon General Robert Olesen, of the Public Health Service, and his staff. Acknowledgment is also made to Medical Director L. L. Lumsden for his constructive criticisms in the preparation of the manuscript.

STUDIES ON DENTAL CARIES

IV. TOOTH MORTALITY[1] IN ELEMENTARY SCHOOL CHILDREN[2]

By John W. Knutson, *Passed Assistant Dental Surgeon*, and Henry Klein, *Associate Dental Officer, United States Public Health Service*

INTRODUCTION

Recent widespread activity in the promotion of dental health programs in the United States is evidence that dental health has become recognized as a major subdivision of the more general problem of national health conservation. Since the loss of teeth resulting from carious processes constitutes an important physical defect found in elementary school children, one of the primary objectives of dental health programs becomes the prevention of tooth loss. Inasmuch as the etiology of dental caries is unknown, prevention of the disease causing these defects is still in the experimental stage. It is generally acknowledged, however, that the treatment of early carious lesions by the proper placement of chemically and physically stable filling materials will largely prevent carious teeth from terminating in tooth loss, or tooth mortality. A primary purpose of dental health programs becomes, therefore, the promulgation of procedures whereby the early detection and treatment of carious teeth is accomplished and tooth mortality thereby prevented.[3]

This perspective on dental programs, and on the problem of dental caries in children, suggests an analogy between the public health approach to dental disease and that which has already been applied to other diseases. In a general way the loss of permanent teeth in children, or tooth mortality in childhood, bears somewhat the same relation to the problem of dental caries as specific death rates bear to the problem of other disease entities. While it has been pointed out many times that death rates alone are not satisfactory indicators of the health of a community or nation, the study of such rates has assisted enormously in recent mass attacks on disease.

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[1] Although the term "tooth mortality" has been infrequently used in the dental literature, it appears to possess definite value in designating deaths among a population of permanent teeth. The term includes, therefore, not only extracted permanent teeth but also those which are indicated for extraction and still present in the mouth. It is clear that "tooth mortality" does not apply to missing deciduous teeth lost through exfoliation, since exfoliation is considered a normal biological process.

[2] From Child Hygiene Investigations, Division of Public Health Methods, National Institute of Health, U. S. Public Health Service.

The preceding papers of this series are as follows:

I. Dental status and dental needs of elementary school children. By Henry Klein, C. E. Palmer, and J. W. Knutson. Pub. Health Rep., 53: 751-765 (May 13, 1938).

II. The use of the normal probability curve for expressing the age distribution of eruption of the permanent teeth. By Henry Klein, C. E. Palmer, and M. Kramer. Growth, 1: 385-394 (1937).

III. A method of determining post-eruptive tooth age. By C. E. Palmer, Henry Klein, and M. Kramer. (In press.) Growth.

[3] The immediate objective for placing fillings in many instances may not be the prevention of tooth loss but to perform such functions as the following: The prevention and allaying of toothache; the prevention of apical abscesses and their sequelae, focal infections; the maintenance of normal occlusion and esthetics; and the maintenance of a normally functioning masticatory unit. However, the performance of these functions operates directly or indirectly to prevent tooth loss.

Recently, Wisan (*1*) has developed a "lost permanent teeth index" based on counts of extracted permanent teeth plus those indicated for extraction, and has proposed that this index of missing teeth, for 7th and 8th grade children or those between 12 and 14 years of age, be used for the purpose of evaluating dental health programs. Before practical use is made of such an index it is essential that very careful study be made of the basic elements which make up the index. Thus it is imperative that detailed information be made available regarding those factors which may be associated with the mortality of permanent teeth in children. The present paper represents an attempt to study certain of these factors as they are found in a representative elementary school population.

MATERIAL AND METHODS

The findings to be presented are concerned with an analysis of tooth mortality rates in the grade school population of Hagerstown, Maryland, a representative urban community in the eastern section of the United States. The enrollment of white children in the first eight grades of the municipal elementary schools of that community was, in October 1936, approximately 4,700. Of this number, 4,416 received, in the spring of 1937, complete dental examinations [4] by dental officers of the United States Public Health Service. The children examined, therefore, include 94 percent of the enrolled elementary school population. The distribution of these children, with respect to such characteristics as age and sex, may be considered representative of many urban communities in the United States.

The tooth mortality rates are determined by counting missing (extracted) permanent teeth and permanent teeth showing only remaining roots (severely decayed); this sum divided by the number of children and multiplied by 100 gives a tooth mortality rate of the number of lost teeth per 100 children. The analysis of the data is made in the following order: First, the distribution of tooth mortality in terms of specified kinds of permanent teeth is described for the elementary grade school population as a whole; second, the tooth mortality rates are considered for children having one or more decayed or missing teeth but no fillings; finally, the tooth mortality rates are discussed for children having one or more decayed or missing teeth and, in addition, one or more filled teeth.

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[4] Details of the manner in which the examinations were made and a general analysis of the findings have been presented in a recent publication (*2*).

FINDINGS

The age and sex distribution of tooth mortality in grade school children studied in terms of numbers of missing teeth per 100 children are presented in table 1. Girls, for each age, have a significantly higher tooth mortality rate than boys. This finding parallels the observation previously reported (*2*) that girls, for each age, have a significantly higher caries rate than boys. This table also shows the manner in which tooth mortality rates increase directly with chronological age. For boys age 6 the rate per 100 children is 0, for age 7, it is 2.5, and it increases gradually until age 15, when the rate has become 118.1. Because of this cumulative characteristic, the yearly increments of numbers of missing teeth per 100 children are readily calculated. For example, since boys age 6 have no missing teeth, the rate at age 7 may be considered as equal to the increment which has accumulated between the sixth and seventh years. It follows, therefore, that the total yearly increment of tooth mortality in the entire elementary school population is the sum of all the annual increments for each age-sex group from 6 through 15 years.

TABLE 1.—*Number of permanent teeth missing and tooth mortality rates (4,416 children, Hagerstown, Md.)*

Age	6	7	8	9	10	11	12	13	14	15	All ages
	Boys										
Number of cases	171	197	231	253	270	262	299	267	199	83	2,232
Number of teeth missing	0	5	10	35	88	77	121	160	148	98	742
Number of teeth missing per 100 cases	0	2.5	4.3	13.8	32.6	29.4	40.5	59.9	74.4	118.1	33.2
	Girls										
Number of cases	156	206	256	240	259	269	297	278	165	58	2,184
Number of teeth missing	1	6	15	55	68	86	154	209	144	69	807
Number of teeth missing per 100 cases	0.6	2.9	5.9	22.9	26.3	32.0	51.9	75.2	87.3	119.0	37.0

Table 2 shows the distribution of tooth mortality by specified kinds of permanent teeth. For all ages in 2,232 boys, the specific contribution of the teeth, in increasing order of their numerical importance to a total tooth mortality of 742 is as follows: 3 canines, 3 second molars, 5 second bicuspids, 8 first bicuspids, 8 lateral incisors, 18 central incisors, and 697 first molars. Similar findings as to the identity of the kinds of teeth contributing to tooth mortality may be noted in the data given for girls.

TABLE 2.—*Number of specified kinds of permanent teeth missing (4,416 children, Hagerstown, Md.)*

Age	6	7	8	9	10	11	12	13	14	15	All ages
BOYS											
Number of cases	171	197	231	253	270	262	299	267	199	83	2,232
Upper											
Central incisors	0	0	1	3	2	0	4	5	2	1	18
Lateral incisors	0	0	0	0	0	0	3	2	0	2	7
Canines	0	0	0	0	0	0	2	1	0	0	3
First bicuspids	0	0	0	0	0	0	0	1	3	3	7
Second bicuspids	0	0	0	0	1	1	0	0	1	0	3
First molars	0	1	1	3	25	14	22	46	36	29	177
Second molars	0	0	0	0	0	0	0	0	0	1	1
Lower											
Central incisors	0	0	0	0	0	0	0	0	0	0	1
Lateral incisors	0	0	0	0	0	0	0	1	0	0	0
Canines	0	0	0	0	0	0	0	0	0	0	
First bicuspids	0	0	0	0	0	0	0	1	0	0	1
Second bicuspids	0	0	0	0	0	0	1	1	0	0	2
First molars	0	4	8	29	60	62	89	101	105	62	520
Second molars	0	0	0	0	0	0	0	1	1	0	2
Total	0	5	10	35	88	77	121	160	148	98	742
GIRLS											
Number of cases	156	206	256	240	259	269	297	278	165	58	2,184
Upper											
Central incisors	0	0	0	0	0	1	3	0	1	3	8
Lateral incisors	1	0	0	0	0	1	1	1	1	1	6
Canines	0	0	0	0	0	0	0	0	0	0	0
First bicuspids	0	0	0	0	0	0	0	0	3	0	3
Second bicuspids	0	0	0	0	0	0	1	0	2	1	4
First molars	0	0	1	9	4	7	25	41	35	16	138
Second molars	0	0	0	0	0	0	0	0	1	0	1
Lower											
Central incisors	0	0	0	0	0	0	0	0	0	0	0
Lateral incisors	0	0	0	0	0	0	1	0	0	0	1
Canines	0	0	0	0	0	0	0	0	0	0	0
First bicuspids	0	0	0	0	0	0	2	0	0	0	2
Second bicuspids	0	0	0	0	0	2	1	1	0	0	4
First molars	0	6	14	46	64	75	119	166	100	48	638
Second molars	0	0	0	0	0	0	1	0	1	0	2
Total	1	6	15	55	68	86	154	209	144	69	807

When the percentages of the total tooth mortality contributed by the first permanent molars (specific for age and sex) are computed, it is clearly indicated that, in the permanent teeth of a representative grade school population, tooth mortality is largely a problem of mortality of the first molars. In no age-sex group do they account for less than 90 percent of the total tooth mortality, and for all ages they account for 93.9 percent in boys and 96.2 percent in girls. These findings are shown in table 3, which presents the percentages of the total tooth mortality contributed by the first molars.

TABLE 3.—*Percentages of total tooth mortality contributed by first permanent molars (4,416 children, Hagerstown, Md.)*

Age	6	7	8	9	10	11	12	13	14	15	All ages
	Boys										
Number of cases	171	197	231	253	270	262	299	267	199	83	2,232
Number of teeth missing	0	5	10	35	88	77	121	160	148	98	742
Number of first molars missing	0	5	9	32	85	76	111	147	141	91	697
Percent of teeth missing that are first molars	------	100.0	90.0	91.4	96.6	98.7	91.7	91.9	95.3	92.9	93.9
Number of first molars missing per 100 children	0	2.5	3.9	12.7	31.5	29.0	37.1	55.1	70.9	109.6	31.2
	Girls										
Number of cases	156	206	256	240	259	269	297	278	165	58	2,184
Number of teeth missing	1	6	15	55	68	86	154	209	144	69	807
Number of first molars missing	0	6	15	55	68	82	144	207	135	64	776
Percent of teeth missing that are first molars	------	100.0	100.0	100.0	100.0	95.4	93.5	99.0	93.8	92.8	96.2
Number of first molars missing per 100 children	0	2.9	5.9	22.9	26.3	30.5	48.5	74.5	81.8	110.3	35.5

A further analysis of the manner in which specified teeth contribute to the total tooth mortality indicates that, although all first permanent molars contribute from 90 to 100 percent of the mortality for any given age, the lower first molars *alone* contribute 70 percent of the total tooth mortality in boys and approximately 80 percent of that occurring in girls (all ages). The percentages of the total number of missing teeth contributed by lower first molars are shown in table 4.

TABLE 4.—*Percentages of total tooth mortality contributed by lower first permanent molars (4,416 children, Hagerstown, Md.)*

Age	6	7	8	9	10	11	12	13	14	15	All ages
	Boys										
Number of cases	171	197	231	253	270	262	299	267	199	83	2,232
Total teeth missing	0	5	10	35	88	77	121	160	148	98	742
Number of lower first molars missing	0	4	8	29	60	62	89	101	105	62	520
Percent of teeth missing that are lower first molars	0	80.0	80.0	82.9	68.2	80.5	73.6	63.1	71.0	63.3	70.1
Number of lower first molars missing per 100 cases	0	2.0	3.5	11.5	22.2	23.7	29.8	37.8	52.8	74.7	23.3
	Girls										
Number of cases	156	206	256	240	259	269	297	278	165	58	2,184
Total teeth missing	1	6	15	55	68	86	154	209	144	69	807
Number of lower first molars missing	0	6	14	46	64	75	119	166	100	48	638
Percent of teeth missing that are lower first molars	0	100.0	93.3	83.6	94.1	87.2	77.3	79.4	69.4	69.6	79.1
Number of lower first molars missing per 100 cases	0	2.9	5.5	19.2	24.7	27.9	40.1	59.7	60.6	82.8	29.2

In a recent report on the dental status of the grade school population under discussion (*2*) it is shown that, in the permanent dentition, the lower first molars account for 87 percent of the total caries experience in the teeth of the lower jaw, and the upper first molars account for 64 percent of the total caries experience in the teeth of the upper jaw. Since, in children, the loss of permanent teeth may be presumed to be largely or almost entirely due to neglected carious processes, the kinds of teeth affected by the highest mortality rates may be postulated to be those having the highest level of caries experience. Clinical observations (*3*), together with the above findings, clearly indicate that the first permanent molars experience the highest tooth mortality rates.

It is generally recognized that tooth eruption and the occurrence of caries in teeth are symmetrical and bilaterally equal. That tooth mortality is also bilaterally equal has been pointed out by Brekhus (*3*). This investigator found that the number of specified kinds of missing teeth in males and females, in both upper and lower jaws, is only one-fourth to one-half of one percent higher on the left than on the right side of the mouth. These slight differences are well within the probable error of his observations. The marked consistency with which tooth mortality tends to be bilaterally equal in the lower first permanent molars of the Hagerstown children is shown in table 5, which presents the number of specified right and left lower first molars missing for each age and sex group. For all ages, the total number of specified lower first molars missing in boys is 260 lower left, 260 lower right, and in girls, 321 lower left, 317 lower right.

TABLE 5.—*Number of lower left, number of lower right, average of numbers of left and right, lower first permanent molars missing, and their mortality rates. (4,416 children, Hagerstown, Md.)*

Age	6	7	8	9	10	11	12	13	14	15	All ages
	Boys										
Number of cases	171	197	231	253	270	262	299	267	199	83	2,232
Lower left first molars missing	0	2	3	16	27	33	47	50	56	26	260
Lower right first molars missing	0	2	5	13	33	29	42	51	49	36	260
Average of left and right lower first molars missing	0	2	4	14.5	30.0	31.0	44.5	50.5	52.5	31.0	260
Average of left and right lower first molars missing per 100 cases	0	1.0	1.7	5.7	11.1	11.8	14.9	18.9	26.4	37.4	11.7
	Girls										
Number of cases	156	206	256	240	259	269	297	278	165	58	2,184
Lower left first molars missing	0	3	8	23	31	38	60	84	51	23	321
Lower right first molars missing	0	3	6	23	33	37	59	82	49	25	317
Average of left and right lower first molars missing	0	3	7	23	32	37.5	59.5	83	50	24	319
Average of left and right lower first molars missing per 100 cases	0	1.5	2.7	9.6	12.4	13.9	20.0	29.9	30.3	41.4	14.6

Findings presented thus far have been concerned with the tooth mortality rates of an entire grade school population. However, it is apparent that the tooth mortality of this grade school population is based on the total tooth mortality experience of three separate groups of children: First, those children having one or more DMF [5] (decayed, missing, or filled) teeth, but no evidence of reparative treatment; second, those children having one or more DMF teeth, one or more of which show objective evidence of treatment (fillings); and third, those children having no DMF teeth. Since only the first and second groups of children contribute to the tooth mortality problem, and since the only criterion [6] which differentiates these two groups is past history of dental treatment, a comparison of their tooth mortality rates should reveal the manner in which fillings affect the characteristic of tooth mortality. However, since evidence indicates that tooth mortality is affected by the level of caries experience, it becomes necessary to examine and compare the DMF rates, or caries attack rates, in these two subdivisions of the school population.

Table 6 shows that, of the 2,232 boys examined, 1,127 have one or more DMF teeth but no evidence of treatment (fillings); 440 have

TABLE 6.—*Number of decayed, missing, or filled (DMF) permanent teeth and DMF rates for 2,175 children without fillings and 987 children with fillings. (3,162 children, Hagerstown, Md.)*

Age	6	7	8	9	10	11	12	13	14	15	All ages
	Boys—Without fillings										
Number of cases	19	55	94	142	164	150	174	143	124	62	1,127
Number of DMF teeth	40	111	192	356	472	485	613	625	633	427	3,954
Number of DMF teeth per 100 cases	210.5	201.8	204.3	250.7	287.8	323.3	352.3	437.1	501.5	688.7	350.8
	Boys—With fillings										
Number of cases	2	2	22	32	49	68	89	86	64	26	440
Number of DMF teeth	3	4	63	97	173	237	455	440	380	163	2,015
Number of DMF teeth per 100 cases	150.0	200.0	286.4	303.1	353.1	348.5	511.2	511.6	593.8	626.9	458.0
	Girls—Without fillings										
Number of cases	27	79	117	129	133	132	150	148	101	32	1,048
Number of DMF teeth	41	155	252	382	422	414	579	729	495	202	3,672
Number of DMF teeth per 100 cases	151.9	196.2	215.4	296.1	317.3	313.6	386.0	492.6	490.1	634.4	350.4
	Girls—With fillings										
Number of cases	4	10	27	45	68	85	110	118	58	22	547
Number of DMF teeth	11	23	76	160	262	374	532	684	392	155	2,669
Number of DMF teeth per 100 cases	275.0	230.0	281.5	355.6	385.3	440.0	483.6	579.7	675.9	704.6	487.9

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[5] Teeth showing objective evidence of caries, past decay (fillings), or which are missing due to extraction are classed as DMF teeth. For full description of DMF concept see reference (4).

[6] The criterion for that group with fillings is the presence of one or more fillings per child. This is no indication of the adequacy of dental treatment. However, a previous report (3) shows that the boys had had 57.3 percent and the girls 53.4 percent of all carious surfaces in the permanent teeth filled at the time of the examination.

one or more DMF teeth, one or more of which have been filled. Of 2,184 girls, 1,084 have one or more DMF teeth but no evidence of treatment, while 547 have one or more DMF teeth, one or more of which show evidence of fillings.[7] It is evident from an examination of this table that both boys and girls in the group with fillings have a significantly higher DMF rate than the children in the group without fillings. For all ages, the boys and girls with fillings have, respectively, 457.9 and 487.9 DMF teeth per 100 children; comparable rates for the children without fillings are, respectively, 350.8 and 350.4 DMF teeth per 100 children. Roughly, the group with fillings has, for all ages, 100 more DMF teeth per 100 children than the group without fillings.

When the tooth mortality rates of these two groups are compared, it is shown (table 7) that the group without fillings (for each age and sex), has a markedly higher rate of lost teeth than the group with fillings. For all ages the boys and girls without fillings have, respectively, 53.2 and 55.3 missing teeth per 100 children, and the boys and girls with fillings have, respectively, 33.6 and 41.5 missing teeth per 100 children. Thus, the boys and girls in the group without fillings have, respectively, 58 percent and 33 percent more missing permanent teeth per 100 children than the boys and girls in the group having one or more DMF teeth filled. Since tooth mortality rates appear to be directly related to DMF rates, the finding that the group of children with fillings has a significantly higher DMF rate, yet a markedly lower tooth mortality rate, affords specific quantitative evidence that the placement of fillings markedly lowers tooth mortality rates.

DISCUSSION

Since the prevention of tooth loss due to carious processes is one of the primary objectives of a dental program, it follows that the adequacy and effectiveness of efforts directed toward accomplishing this objective may be measured by the reduction in tooth mortality rates achieved. A measure of such reduction may be obtained through a comparison of full and accurate counts of all missing teeth, specific for each age and sex, made at yearly intervals. However, it must be conceded that limitations of time, personnel, and funds, might limit the practicability of making such complete periodic counts. This latter consideration suggests that a study of the characteristics of tooth mortality and the component mortality rates of the several kinds of teeth might provide simpler, less time-consuming, yet relatively accurate alternative methods for measuring the effectiveness of a dental program.

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[7] For purposes of convenience, that group with one or more DMF teeth but no evidence of treatment will be designated *without fillings*, and that group with one or more DMF teeth, one or more of which show evidence of treatment will be designated *with fillings*

TABLE 7.—*Number of permanent teeth missing and tooth mortality rates for 2,175 children without fillings and 987 children with fillings. (3,162 children, Hagerstown, Md.)*

Age	6	7	8	9	10	11	12	13	14	15	All ages
	Boys—Without fillings										
Number of cases	19	55	94	142	164	150	174	143	124	62	1,127
Number of teeth missing	0	5	9	33	75	64	89	122	118	84	599
Number of teeth missing per 100 cases	0	9.1	9.6	23.2	45.7	42.7	51.2	85.3	95.2	135.5	53.2
	Boys—With fillings										
Number of cases	2	2	22	32	49	68	89	86	64	26	440
Number of teeth missing	0	0	1	2	13	13	32	37	30	20	148
Number of teeth missing per 100 cases	0	0	4.6	6.3	26.5	19.1	36.0	43.0	46.9	76.9	33.6
	Girls—Without fillings										
Number of cases	27	79	117	129	133	132	150	148	101	32	1,048
Number of teeth missing	1	6	14	50	54	60	103	141	102	49	580
Number of teeth missing per 100 cases	3.7	7.6	12.0	38.8	40.6	45.5	68.7	95.3	101.0	153.1	55.3
	Girls—With fillings										
Number of cases	4	10	27	45	68	85	110	118	58	22	547
Number of teeth missing	0	0	1	5	14	26	51	68	42	20	227
Number of teeth missing per 100 cases	0	0	3.7	11.1	20.6	30.6	46.4	57.6	72.4	90.9	41.5

It has been shown (table 3) that the first permanent molars contribute no less than 90 percent of the total tooth mortality for each age and sex group of a representative grade school population. Since it is evident that any dental program which attempts to conserve teeth must, primarily, be concerned with reducing mortality rates in the first permanent molars, it follows that a relatively accurate measure of that reduction may be obtained through *a comparison of periodic counts of missing first permanent molars.* In this connection it is of interest to note that, when the total tooth mortality rates for boys in the group with fillings were compared with the rates for boys in the group without fillings (table 7), the latter were found to have, over all ages, a mortality rate 58 percent higher than the former.[8] However, when the tooth mortality rates of the first permanent molars alone are used to make this comparison (table 8) the boys, over all ages, in the group without fillings have a 60 percent higher rate. This close agreement in findings is significant in view of the fact that the former method involved making observations on 32 tooth spaces per child and the latter on only 4 tooth spaces per child.

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[8] The first permanent molars contributed no less than 90 percent of the total tooth mortality for each age and sex group of these specially composed groups, and for all ages in the group of boys and girls without fillings they contributed, respectively, 93.2 and 93.0 percent, and in the group of boys and girls with fillings they contributed, respectively, 94.5 and 97.4 percent.

TABLE 8.—*Number of first permanent molars missing and tooth mortality rates for 1,127 boys without fillings and 440 boys with fillings. (1,567 children, Hagerstown, Md.)*

Age	6	7	8	9	10	11	12	13	14	15	All ages
	Boys—Without fillings										
Number of cases	19	55	94	142	164	150	174	143	124	62	1,127
Number of first molars missing	0	5	8	30	72	63	82	115	113	78	566
Number of first molars missing per 100 cases	0	9.1	8.5	21.1	43.9	42.0	47.1	80.4	91.1	125.8	50.2
	Boys—With fillings										
Number of cases	2	2	22	32	49	68	89	86	64	26	440
Number of first molars missing	0	0	1	2	13	13	29	32	28	20	138
Number of first molars missing per 100 cases	0	0	4.6	6.3	26.5	19.1	32.6	37.2	43.8	76.9	31.4

It has been shown (table 3) that the lower first permanent molars contribute 70 percent of the total tooth mortality in boys and 80 percent in girls. From this finding it appears reasonable to assume that any appreciable reduction in tooth loss must be reflected in these latter teeth, which account for approximately three-fourths of the total mortality. It follows that a measure of such reduction might be obtained by a comparison of periodic counts of only missing lower first permanent molars. Furthermore, since the distribution of tooth mortality is bilaterally equal, and since tooth mortality rates of lower first molars have a marked tendency to be equally distributed bilaterally in grade school children (table 5), it follows that a reliable measure of this reduction in mortality rates might be obtained through *a comparison of periodic counts of missing lower right (or left) first permanent molars.*

On the basis of this last postulate, the mortality rates of lower right first permanent molars were used to compare the boys in the group without fillings with the boys in the group with fillings. It is of interest to note (table 9) that by this method of comparison the boys in the group without fillings had (for all ages) a 61 percent higher mortality rate than the boys in the group with fillings. Since counts of all teeth missing gave a 58 percent difference, counts of first molars a 60 percent difference, and counts of lower right first molars a 61 percent difference, it is obvious that the results are very similar. Moreover, the first method involved making observations on 32 tooth spaces, the second, four tooth spaces, and the third, a single tooth space in a single quadrant of the mouth.

TABLE 9.—*Number of lower right first permanent molars missing and tooth mortality rates for 1,127 boys without fillings and 440 boys with fillings. (1,567 children, Hagerstown, Md.)*

Age	6	7	8	9	10	11	12	13	14	15	All ages
	Boys—Without fillings										
Number of cases	19	35	94	142	164	150	127	143	124	62	1,127
Number of lower right first molars missing	0	2	5	12	27	24	30	43	40	28	211
Number of lower right first molars missing per 100 cases	0	3.6	5.3	8.5	16.5	16.0	17.2	30.1	32.3	45.2	18.7
	Boys—With fillings										
Number of cases	2	2	22	32	49	68	89	86	64	26	440
Number of lower right first molars missing	0	0	0	1	6	5	12	8	9	10	51
Number of lower right first molars missing per 100 cases	0	0	0	3.1	12.2	7.4	13.5	9.3	14.1	38.5	11.6

The employment of this third method for determining the level of reduction in tooth mortality should markedly reduce the time, funds, and personnel needed. Without disturbing[9] the seating arrangement of a classroom, an examiner could proceed from child to child merely counting the number of lower right first permanent molars affected by mortality. If the children have been instructed to retract the right cheek in such a manner as to expose the lower right first molar tooth space, the census would be greatly facilitated.

It has been shown (table 1) that tooth mortality is cumulative with respect to chronological age, and that the rate for any given age is equal to the sum of the increments of all previous ages. This characteristic of the age distribution of tooth mortality suggests that counts might be limited to a certain age group. For example, since the tooth mortality rate at age 12 is equal to the sum of the increments of all previous ages, it follows that this rate should be a reliable measure of the total tooth mortality experience through age 12. However, it is evident that the intervention of an influence (dental treatment) may have variable effects on the tooth mortality rates at different age levels, and that counts of only one specific age will not give an indication of such variability. Making counts at alternate ages might provide sufficient data to indicate a tendency for dental treatment to affect tooth mortality rates differently at different age levels. Although a number of other methods for limiting counts according to age selection seem possible, from a study of table 1 it is evident that tooth mortality counts must be specific for age and sex, since there is a marked difference between the sexes for each age.

[9] The amount of disturbance to routine classroom functions caused by the use of a particular dental public health procedure determines to a considerable extent the practicability of that procedure

The various alternatives for making counts of tooth mortality in a grade school population are suggested to facilitate the making of such counts with limited personnel, funds, and time. All of these procedures, however, are subject to sampling variations; other factors being equal, their reliability is directly proportional to the number of cases studied. From these considerations it is evident that in small age-sex groups full counts of tooth mortality would appear necessary. It is also clear that the employment of the third alternative (making counts of missing lower right first permanent molars) should be limited to groups of such size that the bilateral occurrence of tooth mortality will not be appreciably affected by chance variations.

The foregoing interpretations of this study on tooth mortality in a representative school population indicate that tooth mortality rates specific for age and sex may be adapted for measuring the adequacy and effectiveness of dental care (fillings). Although it is apparent that total counts of permanent teeth affected by mortality, specific for each age and sex, should afford the most accurate measure of the status of tooth mortality in a community, several alternative methods for obtaining estimates of that status through sampling procedures have been suggested. It has been shown, for the grade school population studied, that these sampling devices afford a comparatively accurate estimate of the reduction in tooth mortality effected by dental treatment.

Since the proper placement of fillings prevents the extension of decay, it follows that through complete and adequate care the tooth mortality rate may be expected to be considerably reduced in children who may actually have a high incidence of dental caries. Therefore, periodic tooth mortality rates may be used as an index of the adequacy and effectiveness of dental care (fillings) in a specific community,[10] but they should not be considered an index of dental health, since the problem of tooth mortality is only one factor in dental health.

REFERENCES

(*1*) Wisan, J. M.: Evaluating dental health programs. New York State Dental Hygiene Quarterly, 7: 4–8 (July 1937).

(*2*) Klein, Henry, Palmer, C. E., and Knutson, J. W.: Studies on dental caries. I. Dental status and dental needs of elementary school children. Pub. Health Rep. 53: 751–765 (May 13, 1938.)

(*3*) Brekhus, P. J.: Investigations on the loss of human teeth. J. Am. Dent. Assoc., 15: 679–690 (1928).

(*4*) Klein, Henry, and Palmer, C. E.: Dental caries in American Indian children. Pub. Health Bull. No. 239. U. S. Govt. Printing Office. December 1937.

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[10] It is apparent that tooth mortality rates should not be used to compare the effectiveness of different types of dental programs in different communities without taking full account of the numerous variables which may affect those rates, such as differences in caries rates.

A STUDY OF PSEUDOTUBERCULOSIS RODENTIUM RECOVERED FROM A RAT

By V. H. Haas, *Passed Assistant Surgeon, United States Public Health Service*

This report deals with a disease produced in laboratory animals by inoculation with tissue from an infected domestic rat (*Rattus norvegicus*). The lesions of the disease resemble those of plague, and the organism isolated from infected animals is similar in many ways to *Pasteurella pestis.*

SOURCE OF THE DISEASE

A rat trapped in a market was found to have several granules in its spleen. The lesions were about 2 mm in diameter, and were white and firm; they could be lifted from the spleen with a knife point. A smear made from the organ showed a number of bipolar bacilli bearing a morphologic resemblance to *P. pestis.*

GUINEA PIG INOCULATION EXPERIMENTS

Passage through guinea pigs.—A guinea pig inoculated cutaneously and killed on the fifth day was found to have an enlarged inguinal lymph node containing organisms similar to those found in the rat spleen. From this guinea pig the disease was passed to others, a total of 40 animals being infected, some by cutaneous inoculation and others by the subcutaneous route.

Thirty-five guinea pigs died of the disease and five were killed while definitely ill. Four animals did not become sick after inoculation. The causative organism was recovered repeatedly from infected guinea pigs, as will be described later.

Duration of the disease in guinea pigs.—In guinea pigs allowed to die of the infection, the length of life following inoculation was from 12 to 31 days in those infected by the cutaneous route, the average being 21 days, while in those inoculated subcutaneously the time was from 7 to 18 days, averaging 11. As passage through guinea pigs was continued, the disease assumed a somewhat more acute form than that seen at first.

PATHOLOGY IN GUINEA PIGS

The following summary of autopsy findings is based on the examination of 39 guinea pigs.

(1) *Cutaneous lesions.*—Ulcers of ½ to 3 cm in diameter, covered by crusts which varied from thin flakes to thick layers, were present at the inoculation site in half of the animals.

(2) *Subcutaneous reaction.*—Subcutaneous vascular engorgement was present in slightly more than one quarter of the guinea pigs, being moderate in degree in most instances. The animals dying within rel-

atively few days were more frequently involved than those living longer. Subcutaneous gelatinous edema was present twice.

(3) *Mass at inoculation site.*—In more than three quarters of the guinea pigs there was a mass of 2 to 4 cm in diameter at the site of inoculation. In the animals dying more acutely, this mass was indurated, and firm when sectioned, while in those dying more slowly it was caseous, and tended to become globular. Purulent masses were rare.

(4) *Superficial lymph nodes.*—One or both inguinal lymph nodes were involved in every infected animal. There was usually a globular mass in the inguinal region, within which the gland could be seen on section; the inguinal mass varied from less than 1 cm to 3 cm in diameter. In acute cases the lymph node was firm on section, but in the more chronic infections it was caseous. Hemorrhagic nodes, though they occurred, were rare. The axillary lymph nodes were affected in slightly over half the guinea pigs, showing changes similar to those seen in the inguinal nodes.

(5) *Deep lymph nodes.*—The sacroiliac nodes were involved in half the animals, being similar in all respects to diseased superficial nodes, though seldom as greatly enlarged. There were two instances of involvement of mesenteric lymph nodes, which appeared as yellowish white nodules studding the mesentery and omentum. In one of these cases the entire mesentery, omentum, and small intestine were matted together and adherent to the greater curvature of the stomach.

(6) *Spleen.*—The spleen was involved in all the guinea pigs. Characteristic changes were enlargement of one and one-half to three times normal size, dark red discoloration, and mottling with white granules, which varied from a few scattered lesions to a hundred or more. The granules were from pin-point size to 2 or 3 mm. In six guinea pigs the lesions were discrete enough to be lifted from the spleen by a knife point.

(7) *Liver.*—Liver lesions were present in all the infected animals, the lesions being very similar to those in the spleen.

(8) *Lungs.*—Lung lesions were found in all the animals, and were of 3 types. The most common were focal lesions of ½ to 1 mm, consisting of white granules surrounded by dark red areolae; these granules varied in number from a dozen to more than a hundred. Next in frequency were irregular areas of red or grey consolidation varying in extent from 1 cm to an entire lobe. Least common were large caseous lesions, from ½ to 2 cm in diameter, with grey centers and dark red concentric borders up to 5 mm in width.

(9) *Serous cavities.*—Pleural effusion was present in about one third of the animals, in quantities varying from 1 to 15 cc. It was almost always clear. Peritoneal effusion was present in only one-tenth of the cases, being tenacious in one instance only.

A single guinea pig inoculated intraperitoneally died on the eighth day. This animal showed peritoneal exudate of 15 cc of thin red fluid, widespread mesenteric adhesions, and typical lesions of the lung, liver, and spleen.

Smears from tissues.—Organisms were found in the diseased tissues of all except two guinea pigs. There were two forms, viz, bipolar bacilli about half as long as *P. pestis* and rather wide in proportion to their length, and coccoid, solid staining forms. The organisms tended to appear in large aggregates or clumps, so that one microscopic field might show several dozen, while several adjacent fields would show none.

Isolation of causative organisms.—Cultures of a small cocco bacillus were readily obtained by rubbing diseased spleen or lung tissue on blood agar plates, or by inoculating heart blood of sick animals into infusion broth. The typical lesions of the disease were produced in 18 guinea pigs by inoculating them with these cultures; recovery of the organism from these latter animals fulfilled Koch's postulates.

CHARACTERISTICS OF THE ORGANISM

Colonies on blood agar plates: Abundant growth in 18 hours at 30° C.; colonies discrete, pin point, pale white, translucent, convex, and moist, with regular margins; not tenacious. Agar slants: Abundant growth in 18 hours at 30° C.; diffuse growth without distinct colonies; pale, white, translucent, moist, not tenacious. Bouillon cultures: Good growth in 18 hours at 30° C.; broth sometimes uniformly cloudy and sometimes clear with surface growth and slowly settling flakes.

Morphology.—Small rods and cocci on solid media. Rods usually stain bipolar and cocci stain solidly. Rods resemble *P. pestis* but are only one-half to three-fourths as long. No definite arrangement of organisms. In broth the organisms appear much the same as on solid media; there was no definite chain formation. On 3 percent salt agar there are involution forms; these are usually long, slender, slightly curved rods, or medium sized rods lying in bundles in a manner suggestive of the diphtheria bacillus; less frequently there are enlarged hollow staining organisms resembling "balloon" forms of involuted *P. pestis*.

Gram's stain.—The organism is Gram-negative.

Fermentations.—Gas is not produced in any of the common sugars. Acid is produced in dextrose, maltose, galactose, and rhamnose. No acid in lactose or saccharose. Litmus milk unchanged.

Motility.—Motile organisms were seen in two cultures grown at room temperature, but in all other cultures there was no motility, regardless of temperature.

PATHOGENICITY FOR RATS

Four rats were inoculated with cultures, 2 cutaneously and 2 subcutaneously. One rat was inoculated subcutaneously with a diseased guinea pig spleen. None of these rats became ill, but two showed small masses at the site of inoculation.

One of the rats inoculated subcutaneously with bacterial culture was killed on the 14th day. Autopsy showed a small crusted ulcer at the inoculation site, with a subcutaneous mass 2 cm in diameter. The mass was firm and indurated, with considerable injection about it, but no hemorrhage. There was no inguinal adenopathy, but the right axillary node was rather hard, with a diameter of 0.5 cm, and the right sacroiliac node was 0.75 cm in diameter. The spleen was slightly enlarged, very dark, and firm; it contained 5 white granules of 1 mm diameter or less, which were discrete and raised above the surface of the organ. Liver dark red but not mottled; lungs normal; smears from the spleen showed no organisms. A guinea pig inoculated subcutaneously with the spleen of this rat died in 27 days with lesions typical of the disease under consideration, and a guinea pig inoculated from the latter died in 10 days, with typical findings.

The other 4 rats were apparently healthy 30 days after inoculation. They were then inoculated cutaneously with the spleen of a guinea pig dead of plague; one of the rats died on the fourth day with typical plague and the others remained healthy. The three surviving rats were inoculated again with plague on the eighth day following the original inoculation, the second inoculation being subcutaneous. One of these animals died of plague on the fifth day, while the other two remained healthy.

It is evident that the disease under study is only slightly pathogenic for rats, and that it confers on these rodents some degree of protection against plague.

AGGLUTINATION

The organism was agglutinated by the serum of a rabbit immunized against plague in dilution of 1 to 160. The same serum agglutinated *P. pestis* in a dilution of 1 to 1280. Blood from a guinea pig sick with the disease failed to agglutinate the organism. No immune guinea pig serum could be tested, as none of the sick guinea pigs ever recovered.

COMPARISON WITH PLAGUE

The disease under study is sufficiently similar to subacute or chronic plague that in any single guinea pig it would be impossible to differentiate with certainty on the basis of anatomical appearance. In a number of these animals, however, it is clear that the constancy of hepatic lesions is a point of great value in distinguishing between the two diseases, as similar liver granules are seldom encountered in plague in guinea pigs.

The causative organism differs from *P. pestis* morphologically in that the bipolar forms are smaller and the coccoid forms more numerous than in the case of the latter organism. Culturally, the former organism grows faster on solid media than *P. pestis;* it usually produces diffuse cloudiness of broth and regularly forms acid in rhamnose, both of which are points of differentiation. There is also a difference in the appearance of the forms produced on salt agar. Motility is not constant in the organism under study, but it does occur, which is not the case with *P. pestis.*

Pathogenicity for rats is another point of differentiation between the two organisms, *P. pestis* being quite virulent for these rodents whereas the other organism is only slightly pathogenic.

IDENTITY OF THE DISEASE

The disease described above conforms with the available descriptions of pseudotuberculosis rodentium, and the organism isolated is like the causative organism of that disease. It therefore appears that the disease under study is pseudotuberculosis.

ATTEMPTS TO TRANSMIT PSEUDOTUBERCULOSIS BY FLEAS

Thirty female *Xenopsylla cheopis* were fed on guinea pigs infected with pseudotuberculosis at a time when the animals were known to have organisms in their blood, as demonstrated by cultures. These fleas were then allowed to feed on healthy guinea pigs for the remainder of their lives. Feces of the fleas were inoculated into guinea pigs at convenient intervals, and the dead fleas were also inoculated into guinea pigs. None of the guinea pigs ever contracted the disease, either by flea bites or by inoculation with flea feces or with dead fleas, although other groups of *X. cheopis* fed on plague-infected guinea pigs at the time when this experiment was going on became infected with plague and were found to be capable of transmitting the infection by biting.

SUMMARY

Pseudotuberculosis rodentium recovered from a rat was transmitted to guinea pigs and other rats. Pathologically and bacteriologically considerable similarity was found between this disease and subacute plague; the chief differential points have been discussed. Some writers believe that *Bacillus pseudotuberculosis* is a rough variant of *P. pestis,* and it has been claimed that the latter organism has been recovered from supposedly pure cultures of the former by special methods. In the study reported herewith, there has thus far been no indication that the organism of pseudotuberculosis might give rise to variants which would be identical with *P. pestis;* even in those instances in which guinea pigs died of pseudotuberculosis in a week or less, both disease and causative organism remained true to type and could be distinguished from plague and *P. pestis*, respectively.

Attempts to transmit pseudotuberculosis from guinea pig to guinea pig by *Xenopsylla cheopis* were not successful.

DEATHS DURING WEEK ENDED JUNE 4, 1938

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended June 4, 1938	Corresponding week, 1937
Data from 87 large cities of the United States:		
Total deaths	7,817	[1] 8,128
Average for 3 prior years	8,104	
Total deaths, first 22 weeks of year	190,707	211,781
Deaths under 1 year of age	484	[1] 547
Average for 3 prior years	547	
Deaths under 1 year of age, first 22 weeks of year	11,781	13,062
Data from industrial insurance companies:		
Policies in force	68,305,548	69,785,134
Number of death claims	10,143	10,174
Death claims per 1,000 policies in force, annual rate	7.7	7.6
Death claims per 1,000 policies, first 22 weeks of year, annual rate	9.8	10.9

[1] Data for 86 cities.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers.

In these and the following tables, a zero (0) indicates a positive report and has the same significance as any other figure, while leaders (-------) represent no report, with the implication that cases or deaths may have occurred but were not reported to the State health officer.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended June 11, 1938 and June 12, 1937

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended June 11, 1938	Week ended June 12, 1937	Week ended June 11, 1938	Week ended June 12, 1937	Week ended June 11, 1938	Week ended June 12, 1937	Week ended June 11, 1938	Week ended June 12, 1937
New England States:								
Maine	2	0	2	--------	105	--------	0	0
New Hampshire	0	1	--------	--------	101	75	0	0
Vermont	0	0	--------	--------	96	2	0	0
Massachusetts	1	3	--------	--------	526	634	3	2
Rhode Island	0	2	--------	--------	2	69	1	0
Connecticut [1]	5	3	4	4	59	130	0	0
Middle Atlantic States:								
New York	27	43	[2] 4	[2] 5	3,605	1,586	4	7
New Jersey	18	6	2	5	477	1,123	1	2
Pennsylvania	25	25	--------	--------	1,912	1,727	6	7
East North Central States:								
Ohio	13	11	--------	14	907	2,290	3	3
Indiana	6	4	1	15	279	379	1	2
Illinois	26	39	10	18	753	457	4	5
Michigan [3]	7	13	1	--------	2,683	279	1	3
Wisconsin	0	3	--------	19	2,822	52	1	1
West North Central States:								
Minnesota	3	3	2	2	412	3	1	0
Iowa [4]	2	0	--------	--------	298	7	2	0
Missouri	14	7	8	23	98	50	0	1
North Dakota	1	2	7	11	84	1	0	0
South Dakota	0	1	--------	--------	--------	2	0	1
Nebraska	4	0	--------	--------	154	10	1	0
Kansas	1	4	3	7	257	25	1	1
South Atlantic States:								
Delaware	2	1	--------	--------	4	22	0	0
Maryland [1] [3] [4]	7	5	3	1	67	195	0	3
District of Columbia	5	7	--------	--------	16	93	0	0
Virginia	2	6	--------	--------	339	228	1	7
West Virginia [4]	3	6	3	17	212	39	4	3
North Carolina	16	5	1	--------	745	196	1	2
South Carolina	2	2	72	85	84	63	1	3
Georgia [1]	3	4	--------	--------	148	--------	0	0
Florida [1]	1	8	2	2	69	--------	2	4

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended June 11, 1938 and June 12, 1937—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended June 11, 1938	Week ended June 12, 1937	Week ended June 11, 1938	Week ended June 12, 1937	Week ended June 11, 1938	Week ended June 12, 1937	Week ended June 11, 1938	Week ended June 12, 1937
East South Central States:								
Kentucky	14	6	5	1	144	198	4	5
Tennessee	3	6	9	16	107	94	1	4
Alabama [1]	10	10	16	9	121	24	6	7
Mississippi [3]	6	1	-------	-------	-------	-------	1	1
West South Central States:								
Arkansas	3	3	9	7	123	6	0	1
Louisiana [1]	10	13	12	14	7	-------	1	2
Oklahoma	1	8	16	18	117	33	1	0
Texas [1]	16	26	191	135	38	366	3	7
Mountain States:								
Montana [4]	1	3	-------	-------	97	8	0	0
Idaho [4]	0	4	4	1	9	60	0	0
Wyoming [4] [5]	0	1	-------	-------	19	21	0	0
Colorado [5]	18	3	-------	-------	143	21	0	0
New Mexico	8	1	-------	-------	72	60	0	0
Arizona	4	2	24	10	3	53	0	0
Utah [3]	0	0	-------	-------	444	49	0	0
Pacific States:								
Washington	2	3	-------	-------	47	93	0	0
Oregon	4	0	14	10	34	10	0	1
California [4]	31	31	22	63	871	273	3	3
Total	327	335	442	512	19,890	11,121	59	88
First 23 weeks of year	11,359	10,605	42,306	271,530	702,121	202,181	1,740	3,516

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended June 11, 1938	Week ended June 12, 1937	Week ended June 11, 1938	Week ended June 12, 1937	Week ended June 11, 1938	Week ended June 12, 1937	Week ended June 11, 1938	Week ended June 12, 1937	Week ended June 11, 1938
New England States:									
Maine	0	0	15	13	0	0	0	1	29
New Hampshire	0	0	1	1	0	0	0	0	1
Vermont	0	0	12	1	0	0	1	0	17
Massachusetts	0	1	352	164	0	0	1	1	104
Rhode Island	0	0	8	37	0	0	0	0	26
Connecticut [1]	0	0	87	91	0	0	2	1	123
Middle Atlantic States:									
New York	1	0	528	574	0	0	7	15	531
New Jersey	1	0	97	101	0	0	1	2	197
Pennsylvania	0	1	223	500	0	0	7	8	232
East North Central States:									
Ohio	1	0	182	310	1	8	7	5	104
Indiana	0	0	34	63	25	7	7	1	17
Illinois	2	1	201	302	15	15	4	5	232
Michigan [3]	1	0	276	501	1	12	3	2	336
Wisconsin	0	0	99	180	0	2	3	2	107
West North Central States:									
Minnesota	0	0	70	26	16	14	0	0	28
Iowa [4]	0	0	56	94	28	30	0	4	87
Missouri	0	1	67	107	88	16	0	7	19
North Dakota	0	0	29	13	19	7	0	0	14
South Dakota	0	0	2	15	17	0	1	0	11
Nebraska	0	1	19	28	4	0	0	2	14
Kansas	0	0	54	72	25	5	0	1	131
South Atlantic States:									
Delaware	0	0	6	7	0	0	0	0	3
Maryland [1] [2] [4]	1	0	41	21	0	0	2	8	46
District of Columbia	0	0	6	6	0	0	0	0	7
Virginia	1	0	16	10	0	0	8	9	68
West Virginia [4]	0	0	12	34	0	0	3	2	76
North Carolina	0	1	16	16	2	0	10	3	329
South Carolina	0	2	0	-------	0	0	6	16	73
Georgia [1]	0	2	10	3	0	0	22	11	44
Florida [1]	1	0	3	5	0	0	5	0	11

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended June 11, 1938 and June 12, 1937—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid and paratyphoid fever		Whooping cough
	Week ended June 11, 1938	Week ended June 12, 1937	Week ended June 11, 1938	Week ended June 12, 1937	Week ended June 11, 1938	Week ended June 12, 1937	Week ended June 11, 1938	Week ended June 12, 1937	Week ended June 11, 1938
East South Central States:									
Kentucky	0	0	20	19	4	3	16	9	99
Tennessee	0	2	10	10	0	0	18	11	60
Alabama [1]	2	1	9	5	4	1	4	11	75
Mississippi [3]	4	7	2	5	1	0	8	5	--------
West South Central States:									
Arkansas	0	4	4	13	4	0	7	6	39
Louisiana [1]	3	2	6	9	0	1	15	11	87
Oklahoma	0	3	20	9	18	1	9	11	78
Texas [1]	3	5	41	101	25	1	38	26	384
Mountain States:									
Montana [4]	0	0	8	11	3	6	0	0	59
Idaho [4]	0	0	5	20	23	1	0	0	4
Wyoming [4] [5]	0	0	3	28	4	3	8	1	3
Colorado [5]	0	0	37	10	5	0	4	4	32
New Mexico	0	0	10	32	3	0	5	0	6
Arizona	0	0	3	4	11	0	10	3	17
Utah [3]	1	0	9	15	0	0	0	0	51
Pacific States:									
Washington	0	0	17	25	11	0	4	0	89
Oregon	0	0	19	30	12	7	0	1	32
California [4]	1	4	145	181	36	8	15	4	423
Total	23	38	2,980	4,011	355	148	256	200	4,545
First 23 weeks of year	450	506	123,877	149,164	11,249	6,898	3,222	2,815	98,803

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[1] Typhus fever, week ended June 11, 1938, 34 cases as follows: Connecticut, 1; Maryland, 1; Georgia, 16; Florida, 5; Alabama, 7; Louisiana, 1; Texas, 3.

[2] New York City only.

[3] Period ended earlier than Saturday.

[4] Rocky Mountain spotted fever, week ended June 11, 1938, 12 cases as follows: Iowa, 1; Maryland, 1; West Virginia, 1; Montana, 1; Idaho, 2; Wyoming, 5; California, 1.

[5] Colorado tick fever, week ended June 11, 1938, 11 cases as follows: Wyoming, 1; Colorado, 10.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week:

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
May 1938										
Maine	--------	8	2	--------	554	--------	0	99	0	--------
Pennsylvania	15	121	--------	2	16,256	--------	2	2,264	0	47
Tennessee	7	17	73	47	534	25	0	75	7	17
West Virginia	7	14	112	--------	1,565	--------	1	103	2	20
Wyoming	0	2	--------	--------	96	--------	0	22	3	4

May 1938	Cases
Actinomycosis:	
Pennsylvania	2
Chickenpox:	
Maine	179
Pennsylvania	2,770
Tennessee	38
West Virginia	151
Wyoming	47
Colorado tick fever:	
Wyoming	4
Dysentery:	
Pennsylvania (amoebic)	2
Pennsylvania (bacillary)	1
Tennessee (amoebic)	3
Tennessee (bacillary)	85
German measles:	
Maine	15
Pennsylvania	103
Tennessee	2

May 1938—Continued	Cases
Impetigo contagiosa:	
Tennessee	1
Mumps:	
Maine	150
Pennsylvania	5,069
Tennessee	224
West Virginia	34
Wyoming	18
Ophthalmia neonatorum:	
Pennsylvania	3
Tennessee	1
Paratyphoid fever:	
Tennessee	1
Rocky Mountain spotted fever:	
Wyoming	7
Septic sore throat:	
Tennessee	17
West Virginia	2
Wyoming	2
Tetanus:	
Tennessee	2

May 1938—Continued	Cases
Trachoma:	
Tennessee	2
Trichinosis:	
Pennsylvania	2
Tularaemia:	
Tennessee	4
Typhus fever:	
Tennessee	2
Undulant fever:	
Maine	1
Pennsylvania	6
Tennessee	1
Vincent's infection:	
Maine	3
Tennessee	5
Whooping cough:	
Maine	188
Pennsylvania	954
Tennessee	191
West Virginia	389
Wyoming	15

PLAGUE INFECTION FOUND IN GROUND SQUIRREL AND FLEAS FROM GROUND SQUIRRELS IN IDAHO

Under date of June 9, 1938, Senior Surg. C. R. Eskey, reported plague infection found in ground squirrel, *Citellus armatus* and in fleas from ground squirrels in Bear Lake County, Idaho, as follows:

Tissue obtained from one ground squirrel shot May 25, 1938, 2 miles south of Bern.

Five fleas collected from one ground squirrel shot May 25, 1938, 2 miles south of Bern.

Eighty fleas collected from 67 ground squirrels shot May 27, 1938, 5 to 8 miles southeast of Montpelier.

PLAGUE INFECTION FOUND IN FLEAS FROM GROUND SQUIRRELS IN MONTANA

Under date of June 9, 1938, Senior Surg. C. R. Eskey reported plague infection found in 284 fleas collected from 88 ground squirrels, *Citellus elegans*, shot 9 miles northwest of West Yellowstone, Gallatin County, Mont.

PLAGUE INFECTION FOUND IN FLEAS FROM DESERT WOOD RATS IN UTAH

Under date of June 9, 1938, Senior Surg. C. R. Eskey reported plague infection found in 7 fleas collected May 20, 1938, from 15 desert wood rats, *Neotoma desertorum*, shot and trapped 11 to 14 miles northwest of Kanab, Kane County, Utah.

CASES OF VENEREAL DISEASES REPORTED FOR APRIL 1938

These reports are published monthly for the information of health officers in order to furnish current data as to the prevalence of the venereal diseases. The figures are taken from reports received from State and city health officers. They are preliminary and are therefore subject to correction. It is hoped that the publication of these reports will stimulate more complete reporting of these diseases.

Reports from States

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Alabama	2,574	8.89	318	1.10
Arizona [1]	----------	----------	----------	----------
Arkansas	1,881	9.18	316	1.54
California	2,108	3.43	1,331	2.16
Colorado	220	2.05	143	1.34
Connecticut	213	1.22	81	.47
Delaware	235	9.00	37	1.42
District of Columbia	221	3.52	144	2.30
Florida [2]	2,455	14.70	256	1.53
Georgia	2,607	8.45	443	1.44
Idaho	68	1.38	23	.47
Illinois	1,952	2.48	931	1.18
Indiana	431	1.21	80	.23
Iowa [2]	365	1.43	175	.69
Kansas	303	1.63	94	.50
Kentucky	747	2.36	276	.95
Louisiana	2,164	10.15	105	.49
Maine	75	.88	40	.47
Maryland	1,130	6.73	260	1.55
Massachusetts	516	1.17	399	.90
Michigan	1,214	2.51	479	.99
Minnesota	255	.96	193	.75
Mississippi	2,530	12.51	2,284	11.29
Missouri	923	2.31	114	.29
Montana [1]	----------	----------	----------	----------
Nebraska	82	.60	81	.59
Nevada	24	2.38	4	.40
New Hampshire	22	.43	8	.16
New Jersey	927	2.13	224	.52
New Mexico	88	2.09	60	1.42
New York	4,900	3.83	1,590	1.23
North Carolina	3,833	10.98	631	1.76
North Dakota	29	.41	38	.54
Ohio [2]	1,856	2.76	428	.64
Oklahoma [2]	635	2.40	287	1.13
Oregon	85	.83	110	1.16
Pennsylvania [3]	1,906	1.87	225	.22
Rhode Island	103	1.51	52	.76
South Carolina [1]	----------	----------	----------	----------
South Dakota	33	.48	23	.33
Tennessee	1,376	4.76	401	1.39
Texas	2,950	4.78	832	1.30
Utah	24	.46	25	.48
Vermont	19	.50	16	.42
Virginia	1,125	4.16	253	.93
Washington	244	1.47	199	1.20
West Virginia [2]	433	2.32	143	.77
Wisconsin [3]	45	.15	106	.36
Wyoming [3]	7	.30	4	.17
Total	45,903	3.64	14,260	1.13

See footnotes at end of table.

Reports from cities of 200,000 population or over

	Syphilis		Gonorrhea	
	Cases reported during month	Monthly case rates per 10,000 population	Cases reported during month	Monthly case rates per 10,000 population
Akron, Ohio [1]	----	----	----	----
Atlanta, Ga.[1]	----	----	----	----
Baltimore, Md	778	4.43	158	1.91
Birmingham, Ala	318	11.26	46	1.63
Boston, Mass	191	2.42	149	1.88
Buffalo, N. Y	123	2.08	50	.84
Chicago, Ill	1,135	3.18	676	1.90
Cincinnati, Ohio	250	5.36	94	2.02
Cleveland, Ohio [1]	----	----	----	----
Columbus, Ohio	62	2.03	18	.59
Dallas, Tex	331	11.43	78	2.69
Dayton, Ohio [1]	----	----	----	----
Denver, Colo	51	1.72	31	1.04
Detroit, Mich	596	3.44	229	1.32
Houston, Tex.[4]	321	9.58	83	2.48
Indianapolis, Ind	34	.90	35	.93
Jersey City, N. J.[1]	----	----	----	----
Kansas City, Mo	85	2.02	6	.14
Los Angeles, Calif	768	5.37	466	3.26
Louisville, Ky	352	10.86	87	2.69
Memphis, Tenn	428	16.03	90	3.37
Milwaukee, Wis.[5]	----	----	----	----
Minneapolis, Minn	76	1.56	58	1.19
Newark, N. J	293	6.32	129	2.78
New Orleans, La	54	1.13	42	.88
New York, N. Y	3,428	4.09	1,144	1.57
Oakland, Calif.[1]	----	----	----	----
Omaha, Nebr	47	2.13	36	1.63
Philadelphia, Pa	628	3.16	----	----
Pittsburgh, Pa	238	3.48	25	.37
Portland, Oreg.[1]	----	----	----	----
Providence, R. I	45	1.74	37	1.43
Rochester, N. Y	44	1.31	25	.74
St. Louis, Mo	322	3.85	78	.93
St. Paul, Minn	43	1.52	22	.78
San Antonio, Tex	128	5.09	56	2.23
San Francisco, Calif	151	2.25	156	2.33
Seattle, Wash	152	4.00	93	2.45
Syracuse, N. Y	78	3.58	19	.87
Toledo, Ohio [1]	----	----	----	----
Washington, D. C.[6]	221	3.52	144	2.30

[1] No report for current month.
[2] Incomplete.
[3] Only cases of syphilis in the infectious stage are reported.
[4] Reported by Jefferson Davis Hospital.
[5] No report during present fiscal year.
[6] Reported by social hygiene clinic.

WEEKLY REPORTS FROM CITIES

City reports for week ended June 4, 1938

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	162	77	30	5,268	518	1,824	14	409	34	1,318	--------
Current week	105	45	30	5,491	373	1,167	25	366	36	1,202	--------
Maine:											
Portland	0	------	0	23	1	1	0	1	0	5	27
New Hampshire:											
Concord	0	------	0	0	0	0	0	0	0	0	8
Manchester	0	------	0	0	1	2	0	0	0	0	15
Nashua	0	------	0	0	1	0	0	1	0	0	4
Vermont:											
Barre	0	------	0	0	0	0	0	0	0	0	2
Burlington	0	------	0	0	0	0	0	0	1	0	9
Rutland	0	------	0	0	0	0	0	0	0	0	4
Massachusetts:											
Boston	0	------	0	197	1	95	0	5	0	15	191
Fall River	0	------	0	0	1	4	0	1	0	4	32
Springfield	0	------	0	47	0	2	0	0	0	12	35
Worcester	1	------	0	4	3	32	0	2	0	15	41
Rhode Island:											
Pawtucket	0	------	0	0	0	2	0	0	0	0	17
Providence	0	------	0	0	8	7	0	3	0	20	47
Connecticut:											
Bridgeport	0	------	0	4	1	5	0	1	0	0	27
Hartford	0	------	2	2	1	23	0	2	0	8	33
New Haven	0	------	0	5	8	3	0	1	0	13	36
New York:											
Buffalo	0	------	0	8	9	36	0	1	0	6	153
New York	16	2	2	1,071	91	206	0	80	1	233	1,411
Rochester	0	------	0	59	7	19	0	2	0	4	75
Syracuse	0	------	0	96	1	5	0	1	0	6	55
New Jersey:											
Camden	3	------	0	9	2	6	0	0	0	9	33
Newark	0	1	0	21	7	12	0	2	0	27	87
Trenton	0	------	0	1	2	6	0	3	1	0	33
Pennsylvania:											
Philadelphia	9	4	3	444	18	81	0	22	8	19	408
Pittsburgh	3	------	0	25	10	24	0	14	2	32	154
Reading	0	------	0	35	0	1	0	1	0	7	29
Scranton	0	------	--------	1	-------	4	0	-------	0	1	--------
Ohio:											
Cincinnati	3	------	0	14	5	6	0	8	0	7	126
Cleveland	1	5	0	239	13	33	0	7	1	46	198
Columbus	0	2	2	12	4	5	0	5	0	0	98
Toledo	0	1	1	69	2	6	0	3	0	23	67
Indiana:											
Anderson	0	------	0	4	1	3	0	0	0	0	14
Fort Wayne	0	------	0	40	3	8	0	0	0	0	29
Indianapolis	0	------	0	130	5	13	1	10	1	6	96
Muncie	0	------	0	0	2	0	0	0	0	0	10
South Bend	0	------	0	33	0	0	0	0	0	0	6
Terre Haute	1	------	0	2	0	1	1	0	0	0	18
Illinois:											
Alton	0	------	0	0	0	0	0	0	0	0	5
Chicago	17	5	5	165	25	167	0	43	0	122	695
Elgin	0	------	0	1	1	4	0	0	0	2	7
Moline	0	------	0	5	0	4	0	0	0	1	4
Springfield	0	------	0	5	2	3	1	0	0	5	21
Michigan:											
Detroit	4	1	0	162	12	95	0	24	0	153	257
Flint	0	------	0	134	4	10	0	0	0	9	27
Grand Rapids	0	------	0	126	2	8	0	0	0	4	32
Wisconsin:											
Kenosha	0	------	0	63	0	0	0	0	0	4	9
Madison	0	------	0	207	0	3	0	0	0	6	8
Milwaukee	0	------	0	20	2	31	0	4	0	53	105
Racine	0	------	0	116	0	12	0	0	0	13	11
Superior	0	------	0	33	0	0	0	0	0	2	14
Minnesota:											
Duluth	0	------	0	21	2	0	0	0	1	4	26
Minneapolis	1	------	0	282	4	20	13	2	0	8	94
St. Paul	0	------	0	5	0	5	0	1	0	16	67

City reports for week ended June 4, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Iowa:											
Cedar Rapids	0	------	------	13	------	1	0	------	0	5	------
Davenport	0	------	------	0	------	0	0	------	0	0	------
Des Moines	0	------	0	27	0	14	9	0	0	0	22
Sioux City	0	------	------	105	------	4	0	------	0	12	------
Waterloo	0	------	------	6	------	8	0	------	0	2	------
Missouri:											
Kansas City	0	------	0	2	4	5	0	3	0	0	85
St. Joseph	0	------	0	0	1	0	0	0	0	0	13
St. Louis	2	1	1	3	6	30	6	12	1	2	167
North Dakota:											
Fargo	0	------	0	1	1	0	0	0	0	1	8
Grand Forks	0	------	------	9	------	0	0	------	0	0	------
Minot	0	------	0	3	0	0	0	0	0	3	4
South Dakota:											
Aberdeen	0	------	------	0	------	1	0	------	0	0	------
Sioux Falls	0	------	0	0	0	1	0	0	0	0	11
Nebraska:											
Lincoln	0	------	------	30	------	3	0	------	0	2	------
Omaha	0	------	0	132	4	0	0	1	0	1	65
Kansas:											
Lawrence	0	------	0	6	1	0	0	1	0	1	1
Topeka	0	------	0	45	1	1	0	0	0	13	27
Wichita	0	------	0	36	1	3	1	0	0	12	21
Delaware:											
Wilmington	0	------	0	1	8	3	0	0	1	5	26
Maryland:											
Baltimore	0	1	0	22	11	32	0	13	0	35	109
Cumberland	0	------	0	9	0	0	0	0	0	0	13
Frederick	0	------	0	0	0	0	0	0	0	0	3
District of Columbia: Washington	6	2	0	44	4	11	0	8	1	12	135
Virginia:											
Lynchburg	0	------	1	0	0	0	0	0	0	2	15
Norfolk	0	------	0	0	1	4	0	1	0	2	20
Richmond	2	------	0	170	2	1	0	4	0	0	44
Roanoke	0	------	0	0	2	2	0	1	0	0	21
West Virginia:											
Charleston	0	------	0	0	4	0	0	0	2	0	16
Wheeling	0	------	0	9	0	0	0	0	0	8	21
North Carolina:											
Gastonia	0	------	------	7	------	0	0	------	0	3	------
Raleigh	0	------	0	16	1	0	0	1	0	15	22
Wilmington	0	------	0	6	0	0	0	1	0	5	13
Winston-Salem	0	------	0	36	0	0	0	0	0	18	10
South Carolina:											
Charleston	0	------	1	1	2	1	0	0	0	0	23
Florence	0	------	0	3	1	0	0	0	0	0	8
Greenville	0	------	0	4	0	0	0	0	0	3	8
Georgia:											
Atlanta	0	2	1	1	2	1	0	2	3	9	58
Brunswick	0	------	0	21	0	0	0	0	0	0	3
Savannah	0	------	0	4	1	0	0	5	2	7	32
Florida:											
Miami	0	1	0	0	3	0	0	0	1	7	39
Tampa	8	------	0	5	1	0	0	1	1	1	22
Kentucky:											
Ashland	1	------	------	0	------	0	0	------	0	0	------
Covington	2	------	0	0	0	1	0	2	0	0	6
Lexington	0	------	0	9	0	0	0	1	0	1	19
Louisville	2	1	0	31	6	7	0	6	0	4	65
Tennessee:											
Knoxville	0	2	0	11	2	10	0	3	0	3	30
Memphis	0	8	2	4	1	8	0	7	0	3	97
Nashville	0	------	0	13	5	0	0	2	0	2	54
Alabama:											
Birmingham	1	5	0	11	6	1	0	0	0	0	47
Mobile	0	------	0	0	0	0	0	0	0	0	10
Montgomery	1	------	------	3	------	0	0	------	1	3	------
Arkansas:											
Fort Smith	0	------	------	3	------	0	0	------	0	0	------
Little Rock	0	------	0	1	5	0	0	3	0	0	------
Louisiana:											
Lake Charles	0	0	------	1	0	0	0	0	0	0	2
New Orleans	3	8	3	11	7	0	0	11	2	9	129
Shreveport	0	------	0	0	2	0	0	2	2	0	36

City reports for week ended June 4, 1938—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Oklahoma:											
Oklahoma City	0	------	0	3	5	2	0	2	0	1	41
Tulsa	0	------	------	43	------	0	7	------	0	8	------
Texas:											
Dallas	1	4	4	5	4	11	0	2	3	5	69
Fort Worth	0	------	0	1	5	3	0	6	0	0	48
Galveston	0	------	0	0	5	0	0	0	0	0	15
Houston	1	------	0	0	4	3	1	5	1	0	70
San Antonio	3	------	0	0	6	0	0	7	0	7	82
Montana:											
Billings	0	------	0	0	0	0	0	1	0	5	7
Great Falls	0	------	0	2	2	1	0	1	0	5	11
Helena	0	------	0	0	0	5	0	0	0	0	6
Missoula	0	------	0	0	0	1	0	0	0	0	3
Idaho:											
Boise	0	------	0	0	0	1	0	0	0	0	5
Colorado:											
Colorado Springs	0	------	0	0	0	0	0	0	0	3	21
Denver	9	------	1	19	6	16	0	4	0	9	73
Pueblo	0	------	0	19	0	0	0	0	0	5	4
New Mexico:											
Albuquerque	0	------	0	1	3	0	0	6	0	1	18
Utah:											
Salt Lake City	0	------	0	103	3	5	0	1	0	10	34
Washington:											
Seattle	0	------	1	3	2	1	0	0	1	39	85
Spokane	0	------	0	3	3	0	1	0	0	5	28
Tacoma	0	------	0	0	1	1	0	1	0	3	26
Oregon:											
Portland	0	------	2	26	5	9	3	1	0	5	93
Salem	0	------	------	2	------	0	0	------	0	0	------
California:											
Los Angeles	12	3	1	53	11	29	0	12	1	32	256
Sacramento	0	------	0	34	0	0	0	3	0	6	21
San Francisco	3	1	0	3	5	14	0	6	0	29	103

State and city	Meningococcus meningitis		Poliomyelitis cases	State and City	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
New York:				Tennessee:			
New York	1	1	0	Knoxville	1	0	0
Pennsylvania:				Memphis	0	0	1
Philadelphia	1	0	0	Alabama:			
Ohio:				Birmingham	1	0	0
Cincinnati	3	1	0	Louisiana:			
Toledo	0	0	1	New Orleans	0	0	2
Illinois:				Texas:			
Chicago	2	0	0	Houston	2	0	1
Springfield	1	0	0	Montana:			
Michigan:				Helena	1	1	0
Detroit	1	0	1	Colorado:			
Missouri:				Denver	0	0	1
St. Louis	2	0	0	Oregon:			
Maryland:				Portland	1	1	0
Baltimore	0	1	0	California:			
District of Columbia:				Los Angeles	1	0	0
Washington	2	2	0				
Kentucky:							
Louisville	1	0	0				

Encephalitis, epidemic or lethargic.—Cases: New York, 1.
Pellagra.—Cases: Chicago, 1; Charleston, S. C., 1; Atlanta, 2; Savannah, 3; Birmingham, 3; Los Angeles, 1.

FOREIGN AND INSULAR

DENMARK

Notifiable diseases—January–March 1938.—During the months of January, February, and March 1938, cases of certain notifiable diseases were reported in Denmark as follows:

Disease	January	February	March	Disease	January	February	March
Cerebrospinal meningitis	5	3	10	Paradysentery	15	20	28
Chickenpox	1,982	1,806	1,775	Paratyphoid fever	2	4	6
Diphtheria	98	72	57	Poliomyelitis	7	5	5
Epidemic encephalitis	3	2	1	Puerperal fever	28	22	26
Erysipelas	319	239	260	Scarlet fever	1,009	694	581
German measles	297	305	399	Syphilis	58	54	31
Gonorrhea	786	657	738	Tetanus, neonatorum	6	8	3
Influenza	7,152	6,100	12,311	Tetanus, traumatic			2
Lymphogranuloma	3			Typhoid fever	8		8
Malaria	6	1	1	Undulant fever	46	47	45
Measles	6,717	6,955	7,365	Weil's disease	3	1	
Mumps	794	656	655	Whooping cough	1,122	1,022	1,076

ITALY

Communicable diseases—4 weeks ended March 27, 1938.—During the 4 weeks ended March 27, 1938, cases of certain communicable diseases were reported in Italy as follows:

Disease	Feb. 28–Mar. 6	Mar. 7–13	Mar. 14–20	Mar. 21–27
Anthrax	7	8	8	7
Cerebrospinal meningitis	46	57	60	55
Chickenpox	401	496	533	501
Diphtheria	505	659	555	615
Dysentery	13	13	6	52
Hookworm disease	7	23	13	17
Lethargic encephalitis	2		1	1
Measles	3,199	3,921	4,255	3,714
Mumps	340	358	408	413
Paratyphoid fever	31	22	28	28
Pellagra	11	5	6	28
Poliomyelitis	16	24	16	17
Puerperal fever	39	33	32	33
Scarlet fever	286	321	304	339
Typhoid fever	202	193	204	216
Undulant fever	97	100	133	126
Whooping cough	305	459	407	426

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

From medical officers of the Public Health Service, American consuls, International Office of Public Health, Pan American Sanitary Bureau, health section of the League of Nations, and other sources. The reports contained in the following table must not be considered as complete or final as regards either the list of countries included or the figures for the particular countries for which reports are given.

CHOLERA

[C indicates cases; D, deaths; P, present]

Place		Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29, 1938	Jan. 30–Feb. 26, 1938	Week ended—												
						March 1938				April 1938					May 1938			
						5	12	19	26	2	9	16	23	30	7	14	21	28
Afghanistan.[1]																		
China:																		
Hong Kong	C	7	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	2
	D	7	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Kwangchow Wan	C	12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	D	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Macao	C	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Shanghai	C	237	22	3	—	—	—	—	—	—	—	—	—	—	—	—	2	13
Swatow [2]	C	101	2	—	—	—	—	—	—	—	—	—	—	1	—	—	4	4
Dutch East Indies: Macassar	C	—	—	—	—	—	—	—	—	—	[3] 1	—	—	—	—	—	—	—
India	C	6,802	5,326	9,330	6,718	1,765	2,718	3,401	4,677	1,534	4,353	5,098	—	—	—	—	—	—
	D	3,737	2,644	4,602	3,493	871	1,285	1,514	2,148	674	2,125	2,372	—	—	—	—	—	—
Allahabad	C	—	—	—	—	1	—	1	2	2	—	—	3	3	8	1	1	2
Assam	C	87	139	262	143	61	57	77	103	136	258	196	182	166	162	129	186	—
	D	53	56	141	80	23	32	38	40	60	125	100	94	90	93	58	83	—
Bassein	C	—	—	—	—	—	1	—	—	[4] 1	1	2	—	—	—	—	2	1
Bombay Presidency	C	363	191	10	4	2	4	8	—	47	4	—	—	—	—	—	—	—
	D	171	117	7	2	1	2	6	—	36	2	—	—	—	—	—	—	—
Bombay	C	—	—	—	—	—	—	—	—	—	—	—	—	—	[4] 1	—	—	—
Calcutta	C	80	69	122	226	68	118	154	204	158	134	122	125	92	96	113	125	102
Cawnpore	C	—	—	—	—	—	—	—	—	—	—	—	—	1	—	6	7	2
	D	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	2	4
Central Provinces and Berar	C	356	113	40	56	10	10	61	132	267	769	643	963	1,397	1,098	1,097	1,538	1,907
Chittagong	C	—	—	—	1	1	—	—	—	—	[4] 2	—	—	3	1	1	—	—
Delhi	C	1	—	—	—	—	—	—	—	1	1	1	22	4	17	6	10	41
Jodhpur	C	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—
Madras Presidency	C	1,204	2,654	3,914	957	251	231	154	69	54	70	305	597	—	—	—	—	—
	D	431	1,178	1,804	466	127	123	83	43	24	27	125	255	—	—	—	—	—

[1] Cholera reported present early in June in South Afghanistan, Afghanistan.

[2] Under date of June 7, 1938, the American Consul at Swatow reported approximately 200 cases of cholera with 50 deaths, in Swatow, China, for the period May 29–June 6, 1938.

[3] El Tor strain.

[4] Imported.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

CHOLERA—Continued

[C indicates cases; D, deaths; P, present]

Place		Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29, 1938	Jan. 30–Feb. 26, 1938	Week ended—												
						March 1938				April 1938					May 1938			
						5	12	19	26	2	9	16	23	30	7	14	21	28
India—Continued.																		
Madras	C	233	160	120	16	------	2	1	------	1	------	------	4	4	------	1	------	------
	D	34	40	29	6	------	2	------	------	------	------	------	1	3	------	------	------	------
Northwest Frontier Province	C	------	------	------	------	------	------	------	------	------	------	------	------	1	17	56	122	89
Orissa Province	C	91	39	77	82	29	20	31	22	29	54	56	------	30	88	197	87	------
Punjab	C	------	------	------	------	------	------	------	------	[4] 2	2	23	457	606	577	476	537	------
Rangoon	C	1	------	2	------	------	------	------	1	------	------	------	------	------	------	------	1	------
Sind State	C	------	------	------	------	------	------	------	------	------	------	1	------	1	2	2	6	47
Larkana	C	------	------	------	------	------	------	------	------	------	[5] 1	------	------	------	------	------	------	------
Vizagapatam	C	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------
India (French):																		
Chandernagor Territory	C	4	1	7	10	------	1	4	4	3	5	10	3	6	------	------	------	------
Karikal Province	C	------	------	1	4	------	------	------	8	------	------	------	------	------	------	------	------	------
Pondichery Province	C	------	1	3	------	16	10	1	8	2	4	------	------	------	------	------	------	------
India (Portuguese): Noroli	C	------	------	------	------	------	------	------	7	------	------	------	------	------	------	------	------	------
Indochina (French):																		
Annam Province	C	364	94	63	338	1	2	4	6	------	81	65	76	229	213	85	198	119
Tonkin Province	C	2,312	509	59	55	1	8	29	17	88	109	121	425	300	543	542	386	188
Haiphong	C	44	1	------	------	------	------	------	------	------	1	------	------	------	------	------	------	------
	D	27	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Hanoi	C	361	39	3	------			10	7	58	17	13	39	48	48	58	55	32
Siam	C	------	------	------	3	------	------	------	------	------	------	------	------	------	------	------	------	------

On vessels:

S. S. *Ranee* at Calcutta from Port Said and Blyth	1 case	Dec. 31, 1937
S. S. *Karoa* at Rangoon from Calcutta	1 case	Mar. 21, 1938
S. S. *Tsushima Maru* at Calcutta from Japan	1 case	Apr. 16, 1938
S. S. *Mandasor* at Calcutta	1 case	Apr. 18, 1938

PLAGUE [1]

Belgian Congo	C	---	2	---	---	---	---	4	---	4	---	---	---	---	---	---	3	---
Bolivia:																		
Chuquisaca Department	C	---	---	2	35	---	---	---	---	---	3	---	---	---	---	---	---	---
Sucre	C	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Santa Cruz Department	C	---	---	---	[2] 1	---	---	---	[2] 1	---	---	---	---	---	---	---	---	---
Tarija Department	C	---	---	54	3	---	---	---	---	---	---	---	---	---	---	---	---	---
Brazil. (See table below.)																		
British East Africa:																		
Kenya	C	10	---	---	4	---	---	1	---	2	2	---	---	---	---	---	---	---
Uganda	C	67	38	39	24	---	7	7	---	1	2	---	---	4	2	7	---	---
	D	56	30	39	24	---	7	7	---	1	2	---	---	4	2	6	---	---
Ceylon:																		
Colombo	C	1	1	1	2	---	1	---	---	---	---	---	---	1	2	1	---	---
	D	1	1	1	2	---	---	---	---	---	---	---	---	---	2	2	---	---
Plague-infected rats		---	---	---	---	2	3	---	---	---	---	---	---	2	---	---	---	1
China. [3]																		
Dutch East Indies:																		
Java and Madura	C	311	247	297	306	63	62	55	---	---	---	---	---	---	---	---	---	---
	D	311	247	296	301	63	60	55	---	---	---	---	---	---	---	---	---	---
Pasoeroean (vicinity of)	C	5	2	2	3	---	---	---	---	1	---	---	---	---	---	---	---	---
Ecuador:																		
Chimborazo Province—Chimbo	C	---	---	---	---	10	---	---	---	---	---	---	---	---	---	---	---	---
Colimes	C	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Guayaquil	C	---	2	4	5	2	1	2	---	7	1	---	---	3	1	1	---	---
	D	---	1	2	2	3	---	1	---	4	1	---	---	3	---	1	---	---
Plague-infected rats		3	2	---	3	---	1	---	1	---	---	---	---	---	1	---	---	---
Parroquia Eloy Alfaro	C	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Egypt:																		
Asyut Province	C	1	---	1	---	---	---	---	---	---	[2] 1	---	---	---	1	2	3	1
Beheira Province	C	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Gharbiya Province	C	---	---	1	---	---	---	---	---	---	---	---	---	---	---	---	---	---

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[1] Including plague in the United States and its possessions.
[2] Pneumonic.
[3] Information dated May 9, 1938, states that an outbreak of bubonic plague has occurred in Kochow District, and on Hainan Island, China.
[4] Imported.
[5] Suspected.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths; P, present]

Place		Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29, 1938	Jan. 30–Feb. 26, 1938	Week ended—												
						March 1938				April 1938					May 1938			
						5	12	19	26	2	9	16	23	30	7	14	21	28
Hawaii Territory:[4] Plague-infected rats:																		
Hawaii Island—Hamakua District:																		
Hamakua Mill Sector		4	8	1	2													
Kukaiau										2								
Paauhau Sector		5	2	8	3	1	2			1	1	1		3			2	
Paauilo			18															
Pohakea Sector											1							
Maui Island:																		
Makawao District—Plague-infected rats Omaopio.[4]			6															
Wailuku District—Puunene	D			1														
India	C	1,874	446	1,968	3,482	557	1,148	1,003	1,175	771	547	509						
	D	742	658	965	1,582	348	576	618	484	383	188	253						
Allahabad	C			1		1					1							
Bassein	C			2	2				1	1					1			3
Bombay Presidency	C	59	51	24	7	13	11	8	15	17	15	13	11					
	D	36	37	13	2	6	9	2	11	9	6	8	6					
Central Provinces and Berar	C	552	390	486	838	98	413	225	570	259	250	176	93	43	19	21		2
Cochin	C	1																
Madras Presidency	C	175	160	330	157	21	5	19	24	35	11	11	8					
	D	84	84	174	69	15	1	10	10	12	2	4	4					
Mandalay	C			43			79		42									
	D			41			73		42									
Punjab	C							1										
Rangoon	C				3	2			2		1							
	D				3		1		1			1						
Plague-infected rats								1										
Iraq: Baghdad—Plague-infected rats				1														
Madagascar. (See table below.)																		
Niger Territory. (See table below.)																		
Peru. (See table below.)																		
Tunisia: Tunis: Plague-infected rats			1		1	1												
Union of South Africa	C			[5] 1	13				[6] 7		[5] 4				[5] 3		[5] 18	
Cape Province—Port Elizabeth	C											8						
	D								3									

United States:[7]																	
California:[7] [8]																	
Fresno County [8]—Plague-infected fleas.																	
Santa Cruz County—																	
Plague-infected fleas.																	
Plague-infected ground squirrels											1						
Idaho:[7]																	
Bannock County—Plague-infected squirrel																	1
Bear Lake County—																	
Plague-infected fleas.																	
Plague-infected squirrel																	1
Montana:[7] Gallatin County—Plague-infected fleas.																	
Nevada:[7] Clark County—Plague-infected fleas.																	
Oregon:[7]																	
Baker County—																	
Plague-infected fleas.																	
Plague-infected ground squirrels												2					
Grant County—																	
Plague-infected fleas, lice, and tick.																	
Plague-infected ground squirrel																1	
Utah:[7] Kane County—Plague-infected fleas.																	
Washington:[7]																	
Adams County—																	
Plague-infected fleas and lice.																	
Plague-infected ground squirrels							1										
Lincoln County—Plague-infected ground squirrels										2							
On vessel: S. S. *Ville de Tamatave* at Beirut C									1								

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[4] During the week ended Nov. 20, 1937, plague infection was proved in 10 rats by mass inoculation in Omaopio, Makawao District, Maui Island, Hawaii Territory.

[5] For 2 weeks.

[6] For 4 weeks.

[7] Plague infection proved in insect hosts as follows: *California*—Fresno County, Oct. 7–Nov. 5; Santa Cruz County, Feb. 3–Apr. 27, 1938: *Idaho*—Bear Lake County, May 25–27, 1938; *Montana*—Gallatin County, May 1938; *Nevada*—Clark County, Apr. 14–22, 1938; *Oregon*—Baker County, Apr. 23–May 2, 1938; Grant County, May 12–21, 1938; *Utah*—Kane County, May 20, 1938; *Washington*—Adams County, Mar. 7–30, 1938.

[8] For 5 weeks ended Nov. 6, 1937, plague infection proved in pooled tissue from squirrels, chipmunks, and mice in Fresno County, Calif.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

PLAGUE—Continued

[C indicates cases; D, deaths; P, present]

Place		November 1937	December 1937	January 1938	February 1938	March 1938	April 1938
Brazil: [9] Pernambuco State	C	5					
Madagascar (central region)	C	67	57	69	70	57	
	D	65	56	65	56	55	
Niger Territory	C	85	60			26	
Peru	C	12	6	7	10	7	3
Ancash Department	C	3					
Lambayeque Department	C			1	2		
Libertad Department	C	1			1	2	2
Lima Department	C	8	6	6	7	5	1

[9] For the year 1937, 35 cases of plague with 15 deaths were reported in Brazil as follows: Bahia State, 5 cases, 5 deaths; Ceara State, 2 cases; Parahyba State, 5 cases, 1 death; Pernambuco State, 23 cases, 9 deaths. Information dated Apr. 19, 1938, states that since Mar. 25, 4 deaths from bubonic plague have been reported in the Novo Exu District, Pernambuco State, Brazil.

SMALLPOX

[C indicates cases; D, deaths; P, present]

Place		Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29, 1938	Jan. 30–Feb. 26, 1938	Week ended—												
						March 1938				April 1938					May 1938			
						5	12	19	26	2	9	16	23	30	7	14	21	28
Algeria:																		
Algiers Department	C													1	1			
Constantine Department	C				1										1			
Southern Territories	C												1					
Angola. (See table below.)																		
Argentina. (See table below.)																		
Belgian Congo. (See table below.)																		
Bolivia. (See table below.)																		
Brazil. (See also table below):																		
Bahia (alastrim)	C	6	9															
Santos	C	1																
British East Africa: Tanganyika	C	223		1	190					17			162					
Canada:																		
Alberta	C			2	3				[1] 8		[1] 7		[1] 2					
British Columbia	C			[1] 1	1												1	
Nova Scotia—Halifax	C							1	2									

Quebec	C	1																
Saskatchewan	C			[1] 1	13													
China:																		
Canton	C	1	2	33	79	19	30	17	82	10	7	11						
Dairen	C	1			1			1			2							
Foochow	C	P	P															
Hankow	C			2	3				1	1	6		9		2			
Hong Kong	C	6	13	255	641	185	214	236	131	162	128	56	115	53	34	23	21	9
	D			107	502	138	123	192	131	112	107	56	75	40	38	25	20	10
Macao	C				2					1	1	1	2	3			1	
Shanghai	C		1	7	10	4	1	2	2	2	6	3		1	2	5	1	5
Swatow	C										[2] 1							
Tientsin	C		1															
Colombia (see also table below): Barranquilla	D													1				
Dahomey	C																119	
Dutch East Indies: Batavia	C														3			1
Ecuador: Guayaquil	C	4	3	4	1						1							
Egypt:																		
Alexandria	C																1	
Port Said	C				3	1	5			4	2			3				
Eritrea	C	16		8	7	[3] 14					1							
France. (See table below.)																		
Great Britain: England and Wales—																		
Chester County	C	1																
Kent County—Gravesend	C							2	1						1	1		
Leighton Buzzard	C					2												
Port of London	C								1									
Greece. (See table below.)																		
Guatemala. (See table below.)																		
Honduras: Tela	C															1		1
India	C	1,804	3,930	9,218	10,095	2,692	2,920	3,307	3,833	2,927	3,639	3,193						
	D	408	958	2,645	2,467	673	713	750	855	524	792	744						
Allahabad	C			1						1			1					
Assam	C	37	53	95	90	33	34	57	18	29	66	43	24	57	31	65	43	
Bassein	C			1								1			1		1	1
Bombay Presidency	C	130	570	1,130	2,392	834	842	753	983	743	688	737	623					
	D	41	165	316	674	177	169	185	199	138	136	130	104					
Bombay	C	73	269	690	950	264	234	212	164	142	130	91	95	50	61	38	27	33
	D	30	119	350	545	129	135	127	100	83	65	65	51	36	43	23	22	29
Calcutta	C	24	69	235	431	194	185	261	208	147	228	123	127	143	113	80	76	67
	D	13	43	177	273	132	106	166	161	107	164	115	91	97	88	68	63	53
Cawnpore	C			14	18	2	1	4	6	4	7	6	5	9	5	3	1	1
Central Provinces and Berar	C	7	15	51	230	53	83	38	75	124	117	110	92	64	98	93	22	127
Chittagong	C			3	1		2		[2] 2	1								1
Delhi	C		6	9	13	3		3	5	3	3	7	4	9	10	11	6	5
Karachi	C	2	4	18	12	2	4	6	5	2	3		5	11		2		3
Madras Presidency	C	213	245	899	684	182	195	204	184	169	141	157	146					
	D	26	51	174	129	29	37	31	28	88	28	31	39					

[1] For 2 weeks.
[2] Imported.
[3] For 3 weeks.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29, 1938	Jan. 30–Feb. 26, 1938	Week ended—												
						March 1938				April 1938					May 1938			
						5	12	19	26	2	9	16	23	30	7	14	21	28
India—Continued.																		
Madras	C	50	88	359	248	52	64	69	64	58	57	40	42	38	43	33	27	30
Negapatam	C				6		2	4	2	3		7	1		2	1		
Northwest Frontier Province	C	380	417	748	160	29	31	34	61	8	14		10	54	43	23	36	133
Orissa Province	C	205	353	831	940	224	303	318	446	278	357	149		152	175	156	134	
Punjab	C	404	1,035	1,641	952	249	149	201	237	104	63	146	106	134	109	33	42	
Rangoon	C	5	6	66	42	21	23	24	9	6	4	4	8	1	8	1	2	1
Sind State	C	164	436	643	483	79	180	159	104	172	194	121	158	199	169	192		130
Vizagapatam	C					1		1		1	1							
India (French):																		
Chandernagor Territory	C					1			1			1	1					
Karikal Province	C					1												
Indochina (French) (see also table below):																		
Tonkin Province	C		26	135	707	116	195	227	137		251	188	222	244	123	122		87
Haiphong	C	2	36	169	148	12	9	19	5		15	2	8	5	1	2		
Hanoi	C		1	5	15	2	3	8	3		18	4	9	15	2	3		1
Saigon-Cholon	C			1	1				1			1		1		1		1
Tourane	C														1			
Iran	C	2		4	6				2	1	1							
Iraq	C			13	8					10		1						
Baghdad	C				1													1
Basra Province	C								1									
Japan: Saga Prefecture	C									1								
Mexico (see also table below):																		
Chihuahua	C						1											
Durango	D				2	2						1						
Mexico, D. F.	C	11	2	2	3		1	1		2		3	1					
Monterrey	C	1	1	5	1								1	1		2		
San Luis Potosi	D															2		
Torreon	C		2	7														
	D	4	7	4	2													
Vera Cruz	C		1															

Morocco. (See table below.)																		
Nigeria	C	29	136	104	57				[4]1,224		253							
Lagos	C						1		2	1	2							
Nyasaland	C	11	3	3														
Portugal (see also table below):																		
Lisbon	C	3	2	4	4	5	5	1	1					1	2	2	1	
Portuguese East Africa. (See table below.)																		
Salvador. (See table below.)																		
Senegal. (See table below.)																		
Siam	C			76	26	67		8	9			1	2		1			
Sierra Leone	C				4		[1]4		[1]1		[1]12		[1]11					
Southern Rhodesia	C	121	114	13	21	2	5				6	8	5	9				
Straits Settlements: Singapore	C			1										1				
Sudan (Anglo-Egyptian)	C	88	64	282	63	34	2	18	4	18	12	3	7	19	6	3	7	3
Union of South Africa. (See table below.)																		
Venezuela: Puerto Cabello.[6]																		

On vessels:

S. S. *Egra* at Rangoon from Calcutta	1 case	Nov. 16, 1937
S. S. *Anhui* at Singapore from Hong Kong	1 case	Jan. 19, 1938
S. S. *Rizwani* at Kamaran	1 case	Jan. 19, 1938
S. S. *Tai Seun Hong* at Sandakan from Hong Kong	1 case	Jan. 23, 1938
S. S. *Suisang* at Penang from Hong Kong and Singapore	1 case	Jan. 26, 1938
S. S. *Hong Siang* at Singapore from Amoy, Swatow, and Hong Kong	1 case	Jan. 26, 1938
S. S. *Trace* at Singapore from Hong Kong	1 case	Jan. 27, 1938
S. S. *Muinam* at Singapore from Hong Kong	1 case	Jan. 29, 1938
S. S. *Tatsuta Maru* at Honolulu	1 case	Feb. 4, 1938
S. S. *Circassia* at Aden from Bombay	1 case	Feb. 16, 1938
S. S. *Chantala* at Akyab from Chittagong	1 case	Feb. 18, 1938
S. S. *Empress of Japan* at Honolulu	1 case	Feb. 21, 1938
S. S. *Tilawa* at Singapore from Hong Kong	1 case	Feb. 21, 1938
S. S. *Seringa* at Calcutta from Port Said	1 case	Feb. 24, 1938
S. S. *Yuen Sang* at Singapore from Hong Kong	1 case	Feb. 28, 1938
S. S. *Cathay* at London	1 case	Mar. 4, 1938
S. S. *City of Auckland* at Halifax from Calcutta	1 case	Mar. 5, 1938
S. S. *Kaisar-I-Hind* at Yokohama from Hong Kong	3 cases	Mar. 6–7, 1938
S. S. *Van Heutsz* at Singapore from Amoy, Swatow, and Hong Kong	1 case	Mar. 9, 1938

On vessels—Continued.

S. S. *Hai Hing* at Singapore from Amoy, Swatow, and Hoihow	1 case	Mar. 9, 1938
S. S. *Netuka Maru* at Moji from Dairen	1 case	Mar. 11, 1938
S. S. *Nortiken* at Singapore from Hong Kong and Swatow	1 case	Mar. 13, 1938
S. S. *Kum Sang* at Singapore from Kobe, Amoy, and Hong Kong	1 case	Mar. 16, 1938
S. S. *Haruna Maru* at Kobe from Hong Kong	1 case	Mar. 16, 1938
S. S. *Hinsang* at Sandakan from Hong Kong	2 cases	Mar. 22-24, 1938
S. S. *Kiturin Maru* at Moji from Dairen	1 case	Mar. 31, 1938
S. S. *Sirdhana* at Singapore from Kobe, Amoy, and Hong Kong	1 case	Apr. 1, 1938
S. S. *Prosper* at Singapore from Hong Kong and Swatow	2 cases	Apr. 3, 1938
S. S. *Straithaird* at Fremantle	2 cases	Apr. 7, 1938
S. S. *Shirala* at Singapore from Japan	1 case	Apr. 14, 1938
S. S. *Hosang* at Singapore from Hong Kong	3 cases	Apr. 15, 1938
S. S. *Cremer* at Singapore from Amoy, Swatow, and Hong Kong	1 case	Apr. 19, 1938
S. S. *Jean Laborde* at Singapore from Kobe, Shanghai, Hong Kong, and Saigon	1 case	Apr. 21, 1938
S. S. *Sandriken* at Singapore from Hong Kong	1 case	Apr. 29, 1938

[1] For 2 weeks.

[4] For 4 weeks.

[6] A report dated Feb. 10, 1938, states that 16 cases of smallpox were reported in Puerto Cabello; information dated Feb. 21, states that 4,000 cases of smallpox (alastrim) were reported in Barquisimeto, Lara State, Venezuela, and that smallpox is present from Barquisimeto to Valencia and Marcay.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

SMALLPOX—Continued

[C indicates cases; D, deaths; P, present]

Place		November 1937	December 1937	January 1938	February 1938	March 1938	April 1938
Angola	C		7	19	29		
Argentina	C	1					
Belgian Congo	C	166	292	251	336		
Bolivia:							
Cochabamba Department	C				[6]4		1
La Paz Department	C				[6]11	9	12
Oruro Department	C						1
Potosi Department	C				[6]5	2	4
Santa Cruz Department	C				[6]5		1
Tarija Department	C					1	
Brazil: Puerto Alegre	C	2					
France	C	2					
Greece: Salonika	C	3	7	10	1	7	
Guatemala	C						1
Indochina (French) (see also table above)	C	197	319	694	564	1,258	
	D	43	91	158	159	237	
Mexico (see also table above):							
Chiapas State	C				1	1	
Chihuahua State	C	21				1	
Coahuila State	C	17					
Durango State	C	17					
Guanajuato State	C	33					
Mexico—Continued:							
Hidalgo State	C					1	
Mexico State	C	3			1		
Mexico, D. F	C	17		8	4	6	
Michoacan State	C	59					
Nayarit State	C						
Nuevo Leon State	C	6					
Queretaro State	C	2			4	6	
San Luis Potosi State	C					1	
Tabasco State	C	1					
Tlaxcala State	C	3					
Vera Cruz State	C	25					
Yucatan State	C	1					
Zacatecas State	C	7					
Morocco	C	2					4
Portugal (see also table above)	C	52	18	62	13		
	D	4	3	2			
Portuguese East Africa	C	8					
Salvador	C			16	2		
Senegal	C				42	54	
Union of South Africa:							
Cape Province	C		42				
Transvaal	C		41				

[6] For January and February.

TYPHUS FEVER

[C indicates cases; D, deaths; P, present]

Place		Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29, 1938	Week ended—																
					February 1938				March 1938				April 1938					May 1938		
					5	12	19	26	5	12	19	26	2	9	16	23	30	7	14	21
Algeria:																				
Algiers Department	C	89	13	24	8	5	5	11	15	36	13	13	16	13	4	6	4	14	7	
Algiers	C				2		1	6	1	2						1	2	5		
Constantine Department	C	23	81	117	13	46	15	24	12	59	26	45	65	33	25	21	16	54	35	
Bone	C		1	2		1		1										1		
Constantine	C			1	4	20		14	4			29	20			5		34	23	
Philippeville	C	1			1	1												1		
Oran Department	C	16	22	5	6	2	3	2	2		1	4	1	3	6		24	10	3	
Southern Territory	C	2	1	1	13	1	1	2		13			2				4	1		
Australia: Brisbane	C			1							1									
Bolivia. (See table below.)																				
British East Africa: Kenya	C			1												1	4			
Bulgaria	C		5	24		2								1	1					
Chile	C	286	196	85	11					21	16	5								
Antofagasta Province	C	4																		
Concepcion Province	C	2	1								8	1								
Iquique	C	1	1																	
Linares Province	C	12	3	2				2												
Malleco Province	C	3	3							6										
Nuble Province	C	19	19	13	1	1	1	7	5	3										
Santiago Province	C	223	157	59	9	4	9	8	12	11	6	1								
Valparaiso	C	5	1	6		1		1	2		1		1				1	1	1	
China (see also table below):																				
Dairen	C	2	1																	
Hankow	C			1	1										1			2		
Harbin	C			1																
Shanghai	C			1						2	8	16	58	27	28	58	65		91	61
Tientsin	C	7	4	1								1	1							

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER—Continued

[C indicates cases; D, deaths; P, present]

Place		Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29, 1938	Week ended—																
					February 1938				March 1938				April 1938					May 1938		
					5	12	19	26	5	12	19	26			16	23	30		14	21
Czechoslovakia. (See table below.)																				
Dutch East Indies: Sumatra. (See table below.)																				
Egypt:																				
Alexandria	C	7	3	1			1	1	1	4	3	3	2	1	4	2		2	1	8
Aswan Province	C							3			16			2			14	13		
Asyut Province	C			1										1				1		
Beheira Province	C			9			1	9		12	21		7	12			59	50		
Beni-Suef Province	C	1																		
Cairo	C		1	3		1	1			7	3	3	2	4	6	7	1	6	2	4
Dakahliya Province	C			1			30	19		17	10		7	5			2	3		
Gharbiya Province	C			3			12	2		4	1		14	8			21	14		
Minufiya Province	C			3				13		2	2		2	14			41	33		
Minya Province	C							5		8	3		2				2	4		
Port Said	C																		1	1
Qena Province	C			1						5	20		38	45			26	28		
Sharkiya Province	C						7			7	5						1	8		
Provinces	C	7	7	61	24	40	54	59	35	61	84	82	80	102	120	148	176	165	214	161
Eritrea: Asmara	C	2																		
Great Britain—England and Wales—Gloucester County	C	1																		
Greece. (See table below.)																				
Guatemala. (See table below.)																				
Hawaii Territory: Honolulu	C	1	1	2		1				1								1		1
Hungary	C														1					
Iran	C		4				1													
Teheran	C						1													
Iraq: Baghdad Province	C															1				
Lithuania. (See table below.)																				
Mexico (see also table below):																				
Chihuahua	C	2																		
Mexico, D. F.	C	13	20	13		4	3	5	3	5	8	2	11	14	10	4	1			
Saltillo	D					1														
San Luis Potosi	D				1															
Tecamachalco	C			7																
Torreon	C	1		1																

Morocco (see also table below)	C	29	315	743	131	204	208	240	299	411	372	234	206	199	243	193	165	162	175	173
Casablanca	C	------	24	79	44	45	67	17	29	70	78	36	24	------	35	19	13	10	77	
Netherlands: Rotterdam	C	------	[1] 1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Palestine:																				
Haifa	C	5	8	4	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	1
Jaffa	C	17	3	5	1	1	1	------	1	1	1	------	------	------	------	2	------	2	------	1
Poland	C	63	141	306	112	76	93	150	145	161	207	176	130	145	125	108	144	100	------	------
	D	5	3	30	6	6	6	5	7	11	11	9	3	4	7	8	8	3	------	------
Portugal. (See table below.)																				
Rumania. (See table below.)																				
Sierra Leone: Freetown	C	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
Straits Settlements: Singapore	C	------	------	2	------	------	1	------	------	------	------	------	------	1	------	------	------	------	------	------
Syria: Deir-ez-Zor	C	------	------	------	------	------	------	10	------	------	------	------	------	------	------	------	------	------	------	------
Trans-Jordan	C	1	------	------	2	------	------	------	------	------	------	3	1	1	------	2	------	------	------	------
Tunisia:																				
Tunis	C	3	2	2	2	------	1	1	3	1	------	3	1	1	3	2	5	5	2	------
Provinces	C	161	57	284	37	32	83	59	100	41	75	45	57	63	------	25	72	45	38	------
Turkey. (See table below.)																				
Union of South Africa. (See table below.)																				
Yugoslavia: Belgrade	C	1	------	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------
On vessels:																				
S. S. *Blackhill* at Philippeville	C	------	------	1	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------	------
S. S. *Empress of Japan* at Yokohama	C	------	------	------	------	------	------	------	------	------	------	------	------	1	------	------	------	------	------	------

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[1] Suspected.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

TYPHUS FEVER—Continued

[C indicates cases; D, deaths; P, present]

Place		November 1937	December 1937	January 1938	February 1938	March 1938	April 1938
Bolivia:							
La Paz Department	C	---	---	---	[1] 18	5	12
Oruro Department	C	---	---	---	[1] 9	3	3
Potosi Department	C	---	---	---	[1] 5	8	5
China. Manchuria—Harbin	C	---	---	3	1	5	---
Czechoslovakia	C	---	---	---	2	2	12
Dutch East Indies: Sumatra	C	---	---	---	[2] 33	---	---
Greece	C	7	7	3	3	---	---
Guatemala	C	---	---	3	---	1	40
Lithuania	C	7	2	12	8	49	---
Mexico (see also table above):							
Aguascalientes State	C	1	---	13	---	---	---
Coahuila State	C	3	---	---	1	---	---
Durango State	C	8	---	---	---	---	---
Guanajuato State	C	22	---	---	---	---	---
Guerrero State	C	2	---	---	---	---	---
Hidalgo State	C	19	---	---	---	6	---
Jalisco State	C	2	---	---	---	1	---
Mexico State	C	42	---	8	7	6	---
Mexico D. F	C	20	---	27	16	28	---
Mexico (see also table above)—Con.							
Mexico, D. F.—Continued.							
Mexico City	D	---	---	5	4	---	---
Michoacan State	C	11	---	---	---	---	---
Oaxaca State	C	3	---	1	---	---	---
Puebla State	C	9	---	---	---	6	---
Queretaro State	C	2	---	---	5	5	---
San Luis Potosi State	C	---	---	5	2	5	---
Zacatecas State	C	6	---	---	---	---	---
Morocco (see also table above)	C	47	914	638	1,119	1,545	1,474
Portugal	C	28	7	2	17	---	---
Rumania	C	110	246	470	510	533	---
Turkey	C	34	45	96	43	48	---
Istanbul	C	4	2	3	10	1	3
Union of South Africa:							
Cape Province	C	75	100	37	43	49	---
Port Elizabeth	C	---	---	2	1	3	1
Natal	C	9	1	---	4	---	1
Orange Free State	C	3	3	30	24	2	---
Transvaal	C	1	1	12	4	4	---

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[1] For January and February.

[2] Tropical typhus fever.

YELLOW FEVER

[C indicates cases; D, deaths; P, present]

Place		Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 26, 1937	Dec. 27, 1937–Jan 29, 1938	Week ended—																
					February 1938				March 1938				April 1938					May 1938			
					5	12	19	26	5	12	19	26	2	9	16	23	30	7	14	21	28
Belgian Congo:																					
Saratumba	C								[1]1												
Zongo	C					[1]7			[1]4												
	D					4			1												
Brazil:[2]																					
Federal District	D						1		1												
Minas Geraes State	D			16	16	9	26	17	26	10	10	9	1	2	2			3	2		
Para State	D			1																	
Rio de Janeiro State	D			6	3	3	2	2	3	11	10	13	4	2	1	1		1	1		
Santa Catherina State	D		1		1				1		2	7	1		8	3	4				
Sao Paulo State	C					P															
	D			19			1				1	1	1								
Colombia:																					
Boyaca Department	D		1																		
Cundinamarca Department	D			1			1	1				1									
Santander Department	D		3											1		1					
Dahomey: Cotonou	C		[1]5																		
French Equatorial Africa: Bangui	D			1																	
Gambia: Georgetown	C			[1]1																	
Gold Coast	C	[3]8	2	[5]9												[1]1		1	[1]1		
	D	3	2													[1]1					
Keta	C			1												[1]1			1		
Ivory Coast:																					
Abidjan	C				1		[1]1														
Agboville	C									[1]1											
Anyama	C			1																	
Gaoua	C		[1]1																		
Grand Bassam	C									2											
Spao Plantations (near Bingerville)	C									2											

[1] Suspected.

[2] See also reports of yellow fever in Brazil in preceding issues of the PUBLIC HEALTH REPORTS for 1938 and 1937.

[3] Includes 1 suspected case.

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER—Continued

YELLOW FEVER—Continued

[C indicates cases; D, deaths; P, present]

Place		Oct. 31–Nov. 27, 1937	Nov. 28–Dec. 25, 1937	Dec. 26, 1937–Jan. 29, 1938	Week ended— February 1938				March 1938				April 1938					May 1938			
					5	12	19	26	5	12	19	26	2	9	16	23	30	7	14	21	23
Nigeria	C	2	[1] 1	[3] 3																	
	D	1		2																	
Paraguay: Asuncion	C	1																			
Senegal	C	[4] 12	3				[1] 1														
	D	2																			
Dakar	C	[5] 2					[1] 1														
Diourbel	D														1						
Rufisque	C	2																			
Thies	C	1																			
Sierra Leone: Kailahun	C																		[1] 1		
Sudan (French)	C			1																	
San	C		1	1																	
Toukoto	C	[1] 1																			

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[1] Suspected.

[3] Includes 1 suspected case.

[4] Includes 3 suspected cases.

[5] Imported.

X